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Psychological interventions for parents of children and adolescents with chronic illness (Review)

Law E, Fisher E, Eccleston C, Palermo TM

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[Intervention Review]

Psychological interventions for parents of children and adolescents with chronic illness

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ABSTRACT

Background

Psychological therapies for parents of children and adolescents with chronic illness aim to improve parenting behavior and mental health, child functioning (behavior/disability, mental health, and medical symptoms), and family functioning.

This is an updated version of the original Cochrane Review (2012) which was first updated in 2015.

Objectives

To evaluate the efficacy and adverse events of psychological therapies for parents of children and adolescents with a chronic illness.

Search methods

We searched CENTRAL, MEDLINE, Embase, PsycINFO, and trials registries for studies published up to July 2018.

Selection criteria

Included studies were randomized controlled trials (RCTs) of psychological interventions for parents of children and adolescents with a chronic illness. In this update we included studies with more than 20 participants per arm. In this update, we included interventions that combined psychological and pharmacological treatments. We included comparison groups that received either non-psychological treatment (e.g. psychoeducation), treatment as usual (e.g. standard medical care without added psychological therapy), or wait-list.

Data collection and analysis

We extracted study characteristics and outcomes post-treatment and at first available follow-up. Primary outcomes were parenting behavior and parent mental health. Secondary outcomes were child behavior/disability, child mental health, child medical symptoms, and family functioning. We pooled data using the standardized mean difference (SMD) and a random-effects model, and evaluated outcomes by medical condition and by therapy type. We assessed risk of bias per Cochrane guidance and quality of evidence using GRADE.

Main results

We added 21 new studies. We removed 23 studies from the previous update that no longer met our inclusion criteria. There are now 44 RCTs, including 4697 participants post-treatment. Studies included children with asthma (4), cancer (7), chronic pain (13), diabetes (15), inflammatory bowel disease (2), skin diseases (1), and traumatic brain injury (3). Therapy types included cognitive-behavioural therapy (CBT; 21), family therapy (4), motivational interviewing (3), multisystemic therapy (4), and problem-solving therapy (PST; 12). We rated risk of bias as low or unclear for most domains, except selective reporting bias, which we rated high for 19 studies due to incomplete

outcome reporting. Evidence quality ranged from very low to moderate. We downgraded evidence due to high heterogeneity, imprecision, and publication bias.

Evaluation of parent outcomes by medical condition

Psychological therapies may improve parenting behavior (e.g. maladaptive or solicitous behaviors; lower scores are better) in children with cancer post-treatment and follow-up (SMD −0.28, 95% confidence interval (CI) −0.43 to −0.13; participants = 664; studies = 3; SMD −0.21, 95% CI −0.37 to −0.05; participants = 625; studies = 3; I^2 = 0%, respectively, low-quality evidence), chronic pain post-treatment and follow-up (SMD −0.29, 95% CI −0.47 to −0.10; participants = 755; studies = 6; SMD −0.35, 95% CI −0.50 to −0.20; participants = 678; studies = 5, respectively, moderate-quality evidence), diabetes post-treatment (SMD −1.39, 95% CI −2.41 to −0.38; participants = 338; studies = 5, very low-quality evidence), and traumatic brain injury post-treatment (SMD −0.74, 95% CI −1.25 to −0.22; participants = 254; studies = 3, very low-quality evidence). For the remaining analyses data were insufficient to evaluate the effect of treatment.

Psychological therapies may improve parent mental health (e.g. depression, anxiety, lower scores are better) in children with cancer post-treatment and follow-up (SMD −0.21, 95% CI −0.35 to −0.08; participants = 836, studies = 6, high-quality evidence; SMD −0.23, 95% CI −0.39 to −0.08; participants = 667; studies = 4, moderate-quality evidence, respectively), and chronic pain post-treatment and follow-up (SMD −0.24, 95% CI −0.42 to −0.06; participants = 490; studies = 3; SMD −0.20, 95% CI −0.38 to −0.02; participants = 482; studies = 3, respectively, low-quality evidence). Parent mental health did not improve in studies of children with diabetes post-treatment (SMD −0.24, 95% CI −0.90 to 0.42; participants = 211; studies = 3, very low-quality evidence). For the remaining analyses, data were insufficient to evaluate the effect of treatment on parent mental health.

Evaluation of parent outcomes by psychological therapy type

CBT may improve parenting behavior post-treatment (SMD −0.45, 95% CI −0.68 to −0.21; participants = 1040; studies = 9, low-quality evidence), and follow-up (SMD −0.26, 95% CI −0.42 to −0.11; participants = 743; studies = 6, moderate-quality evidence). We did not find evidence for a beneficial effect for CBT on parent mental health at post-treatment or follow-up (SMD −0.19, 95% CI −0.41 to 0.03; participants = 811; studies = 8; SMD −0.07, 95% CI −0.34 to 0.20; participants = 592; studies = 5; respectively, very low-quality evidence). PST may improve parenting behavior post-treatment and follow-up (SMD −0.39, 95% CI −0.64 to −0.13; participants = 947; studies = 7, low-quality evidence; SMD −0.54, 95% CI −0.94 to −0.14; participants = 852; studies = 6, very low-quality evidence, respectively), and parent mental health post-treatment and follow-up (SMD −0.30, 95% CI −0.45 to −0.15; participants = 891; studies = 6; SMD −0.21, 95% CI −0.35 to −0.07; participants = 800; studies = 5, respectively, moderate-quality evidence). For the remaining analyses, data were insufficient to evaluate the effect of treatment on parent outcomes.

Adverse events

We could not evaluate treatment safety because most studies (32) did not report on whether adverse events occurred during the study period. In six studies, the authors reported that no adverse events occurred. The remaining six studies reported adverse events and none were attributed to psychological therapy. We rated the quality of evidence for adverse events as moderate.

Authors' conclusions

Psychological therapy may improve parenting behavior among parents of children with cancer, chronic pain, diabetes, and traumatic brain injury. We also found beneficial effects of psychological therapy may also improve parent mental health among parents of children with cancer and chronic pain. CBT and PST may improve parenting behavior. PST may also improve parent mental health. However, the quality of evidence is generally low and there are insufficient data to evaluate most outcomes. Our findings could change as new studies are conducted.

PLAIN LANGUAGE SUMMARY

Psychological therapies for parents of children and adolescents with a longstanding or life-threatening physical illness

Bottom line

We found that psychological therapies may improve parenting behavior for parents of children with cancer, chronic pain, diabetes or traumatic brain injury, and may improve mental health of parents of children with cancer or chronic pain. Cognitive-behavioral therapy (CBT) and problem-solving therapy (PST) are promising types of therapy. We were not able to answer questions about whether psychological therapies are helpful for parents of children with other medical conditions, or whether other types of therapy are helpful, because there were not enough data. Our findings may have been impacted by differences in measures used across studies. New studies may change the results of this review, and so our findings should be interpreted cautiously.

Background

We have updated our previously published review of psychological therapies for parents of children with a longstanding or life-threatening physical illness to include studies published through July 2018.

Parenting a child with a longstanding illness is challenging. Parents may have difficulty balancing caring for their child with other demands and can experience increased stress, sadness, or family conflict. Their children may have emotional or behavioral concerns. Parents can influence their child's adaptation to living with their medical condition. Psychological therapies for parents provide training in skills to modify emotions or behaviors that aim to improve parent, child, and family well-being.

We wanted to understand whether psychological therapies are helpful for parents of children and adolescents (up to age 19) with longstanding illness. We included studies of interventions that were predominantly psychological and delivered to parents compared with non-psychological treatment, treatment as usual, or wait-list. Outcomes were parenting behavior (e.g. protective behaviors), parent mental health, child behavior/disability, child mental health, child medical symptoms, family functioning, and side effects.

Key results

We added 21 new studies in this update and we removed 23 studies that no longer met our inclusion criteria, resulting in 44 randomized controlled trials (randomized controlled trials, where participants are assigned randomly to either one treatment or a different treatment or no treatment, provide the most reliable evidence) with a total of 4697 participants (average child age = 11 years). The length of the studies ranged from one day to 24 months. Studies included children with asthma (4), cancer (7), chronic pain (recurrent or persistent pain for more than three months, including two studies of children with inflammatory bowel disease (15)), diabetes (15), skin diseases (1), and traumatic brain injury (3); one study included children with eczema and children with asthma. Therapy types included CBT (21), family therapy (4), motivational interviewing (3), multisystemic therapy (4), and PST (12). Funding sources included federal and local governments, hospitals, universities, and foundations.

We found that parenting behavior improved in studies of children with cancer, chronic pain, diabetes, and traumatic brain injury immediately after treatment, which continued long-term for parents of children with cancer and chronic pain. Parent mental health improved in studies of children with cancer and chronic pain immediately after treatment, which continued long-term. Parent mental health did not improve in studies of children with diabetes. We found that CBT and PST improved parenting behavior immediately after treatment, which continued long-term. PST also improved parent mental health immediately after treatment and long-term, but CBT did not. We could not evaluate whether the other types of psychological therapy were beneficial for parents due to insufficient data. We found that these treatment effects were generally small. We found that most studies (32 studies) did not report on whether side effects occurred. In the few studies that did, none of the participants experienced side effects from psychological therapy.

Quality of evidence

We rated the quality of the evidence from studies using four levels: very low, low, moderate, or high. Very low-quality evidence means that we are very uncertain about the results. High-quality evidence means that we are very confident in the results. There were not enough data to answer some parts of our review questions. There was sufficient evidence (low to moderate quality) to reach some conclusions about the effects of psychological therapy for parents of children with cancer and chronic pain and the effects of CBT and PST.

SUMMARY OF FINDINGS

Summary of findings 1. Cognitive-behavioral therapy for parents of children with a chronic illness (post-treatment)

Cognitive behavioral therapy compared to any control for parents of children with a chronic illness (post-treatment)

Patient or population: parents of children with chronic illness

Settings: community or medical settings

Intervention: cognitive-behavioural therapy

Comparison: any control

Outcomes	Probable outcome with intervention (effect sizes are presented as SMD[a])	No. of participants (studies)	Quality of the evidence (GRADE)
Parenting behaviors, post-treatment Higher scores indicate greater maladaptive parenting behavior	On average maladaptive parenting behaviors in the intervention groups were 0.45 lower (95% CI −0.68 to −0.21)	1040 participants, 9 studies	⊕⊕⊖⊖ Low[b,c]
Parent mental health symptoms, post-treatment Higher scores indicate greater mental health symptoms	On average, parent mental health symptoms in the intervention groups were 0.19 lower (95% CI −0.41 to −0.03)	811 participants, 8 studies	⊕⊖⊖⊖ Very low[b,c,d]
Child behavior/disability, post-treatment Higher scores indicate greater disability	On average, child disability in the intervention groups was 0.22 lower (95% CI −0.35 to −0.08)	1236 participants, 10 studies	⊕⊕⊕⊖ Moderate[c]
Child mental health symptoms, post-treatment Higher scores indicate greater mental health symptoms	On average, child mental health symptoms in the intervention groups were 0.08 lower (95% CI −0.19 to 0.03)	1786 participants, 15 studies	⊕⊕⊕⊕ High
Child medical symptoms, post-treatment Higher scores indicate greater medical symptoms	On average, child medical symptoms in the intervention groups were 0.38 lower (95% CI −0.71 to -0.06)	1434 participants, 13 studies	⊕⊖⊖⊖ Very low[d,e]
Family functioning, post-treatment Higher scores indicate poorer family functioning	On average, family functioning scores in the intervention groups were 0.11 lower (95% CI −0.35 to 0.13)	429 participants, 5 studies	⊕⊖⊖⊖ Very low[f,g]

CI: confidence interval; **SMD:** standardized mean difference

GRADE Working Group grades of evidence

High-quality: we are very confident that the true effect lies close to that of the estimate of the effect.

Moderate-quality: we are moderately confident in the effect estimate; the true effect is likely to be close to the estimate of effect, but there is a possibility that it is substantially different.

Low-quality: our confidence in the effect estimate is limited; the true effect may be substantially different from the estimate of the effect.

Very low-quality: we have very little confidence in the effect estimate; the true effect is likely to be substantially different from the estimate of effect.

[a]SMD: standardized mean difference, interpreted as 0.2 = small, 0.5 = moderate, 0.7 = large (Cohen 1988).
[b]Downgraded once for heterogeneity.
[c]Downgraded once for high probability of publication bias.
[d]Downgraded once for imprecision (wide confidence intervals).
[e]Downgraded twice for heterogeneity.
[f]Downgraded once for imprecision (small sample size).
[g]Downgraded twice for high probability of publication bias.

Summary of findings 2. Cognitive-behavioral therapy for parents of children with a chronic illness (follow-up)

Cognitive behavioral therapy compared to any control for parents of children with a chronic illness (follow-up)

Patient or population: parents of children with chronic illness

Settings: community or medical settings

Intervention: cognitive-behavioural therapy

Comparison: any control

Outcomes	Probable outcome with intervention (effect sizes are presented as SMD[a])	No. of participants (studies)	Quality of the evidence (GRADE)
Parenting behaviors, follow-up Higher scores indicate greater maladaptive parenting behavior	On average, maladaptive parenting behaviors in the intervention groups were 0.26 lower (95% CI −0.42 to −0.11)	743 participants, 6 studies	⊕⊕⊕⊖ Moderate[b]
Parent mental health symptoms, follow-up Higher scores indicate greater mental health symptoms	On average, parent mental health symptoms in the intervention groups were 0.07 lower (95% CI −0.34 to 0.20)	592 participants, 5 studies	⊕⊖⊖⊖ Very low[b,c,d]
Child behavior/disability, follow-up Higher scores indicate greater disability	On average, child disability in the intervention groups was 0.28 lower (95% CI −0.40 to −0.15)	1038 participants, 8 studies	⊕⊕⊕⊖ Moderate[b]
Child mental health symptoms, follow-up Higher scores indicate greater mental health symptoms	On average, child mental health symptoms in the intervention groups were 0.07 lower (95% CI −0.19 to 0.04)	1244 participants, 10 studies	⊕⊕⊕⊖ Moderate[b]
Child medical symptoms, follow-up Higher scores indicate greater medical symptoms	On average, child medical symptoms in the intervention groups were 0.13 lower (95% CI −0.32 to 0.06)	1136 participants, 10 studies	⊕⊕⊖⊖ Low[b,c]

Family functioning, follow-up Higher scores indicate poorer family functioning	On average, family functioning scores in the intervention groups were 0.04 lower (95% CI −0.32 to 0.24)	201 participants, 3 studies	⊕⊖⊖⊖ Very low[b,e]

CI: confidence interval; **SMD:** standardized mean difference

GRADE Working Group grades of evidence
High-quality: we are very confident that the true effect lies close to that of the estimate of the effect.
Moderate-quality: we are moderately confident in the effect estimate; the true effect is likely to be close to the estimate of effect, but there is a possibility that it is substantially different.
Low-quality: our confidence in the effect estimate is limited; the true effect may be substantially different from the estimate of the effect.
Very low-quality: we have very little confidence in the effect estimate; the true effect is likely to be substantially different from the estimate of effect.

[a]SMD: standardized mean difference, interpreted as 0.2 = small, 0.5 = moderate, 0.7 = large (Cohen 1988).
[b]Downgraded once for high probability of publication bias.
[c]Downgraded once for heterogeneity.
[d]Downgraded once for imprecision due to wide confidence intervals.
[e]Downgraded twice for limitations in study design/implementation.

Summary of findings 3. Problem-solving therapy for parents of children with a chronic illness (post-treatment)

Problem-solving therapy compared to any control for parents of children with a chronic illness (post-treatment)

Patient or population: parents of children with chronic illness

Settings: community or medical settings

Intervention: problem-solving therapy

Comparison: any control

Outcomes	Probable outcome with intervention (effect sizes are presented as SMD[a])	No. of participants (studies)	Quality of the evidence (GRADE)
Parenting behaviors, post-treatment Higher scores indicate greater maladaptive parenting behavior	On average, maladaptive parenting behaviors in the intervention groups were 0.39 lower (95% CI −0.64 to −0.13)	947 participants, 7 studies	⊕⊕⊖⊖ Low[b]
Parent mental health symptoms, post-treatment Higher scores indicate greater mental health symptoms	On average, parental mental health symptoms in the intervention groups were 0.30 lower (95% CI −0.45 to −0.15)	891 participants, 6 studies	⊕⊕⊕⊖ Moderate[c]
Child behavior/disability, post-treatment Higher scores indicate greater disability	On average, child disability in the intervention groups was 0.08 greater (95% CI −0.18 to 0.33)	247 participants, 3 studies	⊕⊖⊖⊖ Very low[d,e]
Child mental health symptoms, post-treatment	On average, child mental health symptoms in the intervention groups was 0.12 lower (95% CI −0.50 to 0.25)	276 participants, 4 studies	⊕⊖⊖⊖ Very low[d,f,g]

Higher scores indicate greater mental health symptoms			
Child medical symptoms, post-treatment Higher scores indicate greater medical symptoms	On average, child medical symptoms in the intervention groups were equivalent 0.25 higher (95% CI −0.23 to 0.72)	679 participants, 5 studies	⊕⊖⊖⊖ Very low[b,c]
Family functioning, post-treatment Higher scores indicate poorer family functioning	On average, family functioning scores in the intervention groups were 0.15 lower (95% CI −0.41 to 0.10)	237 participants, 2 studies	⊕⊖⊖⊖ Very low[d,e]

CI: confidence interval; **SMD:** standardized mean difference

GRADE Working Group grades of evidence
High-quality: we are very confident that the true effect lies close to that of the estimate of the effect.
Moderate-quality: we are moderately confident in the effect estimate; the true effect is likely to be close to the estimate of effect, but there is a possibility that it is substantially different.
Low-quality: our confidence in the effect estimate is limited; the true effect may be substantially different from the estimate of the effect.
Very low-quality: we have very little confidence in the effect estimate; the true effect is likely to be substantially different from the estimate of effect.

[a]SMD: standardized mean difference, interpreted as 0.2 = small, 0.5 = moderate, 0.7 = large (Cohen 1988).[b]Downgraded twice for heterogeneity.
[c]Downgraded once for high probability of publication bias.
[d]Downgraded once for imprecision due to small sample size.
[e]Downgraded twice for high probability of publication bias.
[f]Downgraded once for heterogeneity.
[g]Downgraded once for imprecision due to wide confidence intervals.

Summary of findings 4. Problem-solving therapy for parents of children with a chronic illness (follow-up)

Problem-solving therapy compared to any control for parents of children with a chronic illness (follow-up)

Patient or population: parents of children with chronic illness

Settings: community or medical settings

Intervention: problem-solving therapy

Comparison: any control

Outcomes	Probable outcome with intervention (effect sizes are presented as SMD[a])	No. of participants (studies)	Quality of the evidence (GRADE)
Parenting behaviors, follow-up Higher scores indicate more maladaptive parenting behavior	On average, maladaptive parenting behaviors in the intervention groups were 0.54 lower (95% CI −0.94 to −0.14)	852 participants, 6 studies	⊕⊖⊖⊖ Very low[b,c]
Parent mental health symptoms, follow-up	On average, parent mental health symptoms in the intervention groups were 0.21 lower (95% CI −0.35 to −0.07)	800 participants, 5 studies	⊕⊕⊕⊖ Moderate[d]

Higher scores indicate greater mental health symptoms			
Child behavior/disability, follow-up Higher scores indicate greater disability	Analysis not conducted due to lack of available data.	114 participants, 2 studies	⊕⊖⊖⊖ Very low[d,e]
Child mental health symptoms, follow-up Higher scores indicate greater mental health symptoms	On average, child mental health symptoms in the intervention groups were 0.59 lower (95% CI −0.28 to 1.46)	212 participants, 3 studies	⊕⊖⊖⊖ Very low[f,g]
Child medical symptoms, follow-up Higher scores indicate greater medical symptoms	On average, child medical symptoms in the intervention groups were 0.25 higher (95% CI −0.08 to 0.59)	210 participants, 3 studies	⊕⊖⊖⊖ Very low[f,g]
Family functioning, follow-up Higher scores indicate poorer family functioning	Analysis not conducted due to lack of available data.	101 participants, 1 study	⊕⊖⊖⊖ Very low[d,e]

CI: confidence interval; **SMD:** standardized mean difference

GRADE Working Group grades of evidence
High-quality: we are very confident that the true effect lies close to that of the estimate of the effect;
Moderate-quality: we are moderately confident in the effect estimate; the true effect is likely to be close to the estimate of effect, but there is a possibility that it is substantially different;
Low-quality: our confidence in the effect estimate is limited; the true effect may be substantially different from the estimate of the effect;
Very low-quality: we have very little confidence in the effect estimate; the true effect is likely to be substantially different from the estimate of effect.

[a]SMD: standardized mean difference, interpreted as 0.2 = small, 0.5 = moderate, 0.7 = large (Cohen 1988).
[b]Downgraded twice for heterogeneity.
[c]Downgraded once for imprecision due to wide confidence intervals.
[d]Downgraded once for high probability of publication bias.
[e]Downgraded twice for imprecision due to small sample size.
[f]Downgraded once for imprecision due to small sample size.
[g]Downgraded twice for high probability of publication bias.

BACKGROUND

This is an updated version of the original Cochrane Review (Eccleston 2012b), which was first updated in 2015 (Eccleston 2015).

Description of the condition

Chronic medical conditions in childhood include diseases with a duration of more than three months (e.g. asthma, chronic pain, diabetes mellitus) as well as potentially life-threatening conditions such as cancer. These conditions are common in childhood, impacting up to 27% of children and adolescents (Van Cleave 2010). Over the past century, the prevalence of chronic conditions in childhood has increased while mortality due to acute conditions has decreased (Halfon 2010; Van Cleave 2010). This shift is attributed to medical advances in the diagnosis, prevention, and treatment of acute conditions in childhood (Liu 2015), as well as changes in environmental risk factors for chronic disease, for example, more sedentary lifestyles and poor dietary habits (Han 2010; Popkin 2012). Worldwide, the number of children with a chronic illness is expected to increase over time (Liu 2015). This is problematic because chronic conditions in childhood can impact every domain of daily life, including children's activity participation, schooling, friendships, and emotional functioning, for example, anxiety, depression, oppositional behavior. Parents and families are also impacted and commonly experience emotional distress (e.g. anxiety, depression), maladaptive parenting behaviors (e.g. increased protective or solicitous parenting responses), and poor family functioning, such as family conflict (Cousino 2013; Pinquart 2013; Price 2016).

Parents and families play a critical role in children's adaptation to chronic illness. Across a variety of pediatric populations, maladaptive parenting behaviors, parental distress, and poor family functioning have been associated with poorer child outcomes including greater problematic behaviors and disability (e.g. poor school attendance, decreased participation in extra curricular activities), anxiety and mood symptoms, and more severe medical symptoms (Cousino 2013; Delamater 2014; Leeman 2016; Palermo 2014; Price 2016; Sultan 2016; Wiebe 2016). These associations are hypothesized to be bi-directional; for example, the severity of children's medical symptoms may impact parental distress and vice-versa (Morawska 2015; Palermo 2014). Providing psychological interventions to parents and families of children with chronic conditions has been increasingly promoted as a viable and potentially beneficial approach for children with chronic conditions and their families (Morawska 2015; Palermo 2014; Price 2016; Wiebe 2016). There is a critical need to understand the evidence base for these interventions in order to inform clinical practice and research that will support the health and well-being of these children, their parents, and their families.

Description of the intervention

Psychological interventions for parents and families of children with chronic conditions aim to reduce parental distress and maladaptive parenting behaviors, improve family functioning, and promote the child's health and well-being (Law 2014). These interventions may be delivered only to parents or may be combined with psychological treatment that is also delivered to the child, the family system, and others, for example, school staff or medical providers (Law 2014).

For the purpose of this review, psychological interventions are defined as any psychotherapeutic treatment specifically designed to change parental cognition or behavior, or both, with the intention of improving parent or child outcomes, or both. Existing interventions include cognitive-behavioral therapy (CBT) (e.g. Palermo 2016b), motivational interviewing (MI) (e.g. Ellis 2017a), problem-solving therapy (PST) (e.g. Sahler 2002), and systemic treatments such as family therapy (FT) (e.g. Wysocki 2000), and multisystemic therapy (MST) (e.g. Ellis 2005).

How the intervention might work

Proposed mechanisms of psychological treatments vary depending upon the theoretical orientation and approach of the intervention. Cognitive-behavioral therapy (CBT) is founded in behavioral analysis and operant theory (Bergin1975; Skinner 1953), cognitive theory (Beck 1979), and social learning theory (Bandura 1977). Associations between cognitions, emotions, and behaviors are emphasized and are believed to interact to influence desired outcomes. Thus, treatment is focused on altering maladaptive social/environmental, behavioral, and cognitive factors in order to reduce symptoms and prevent relapse.

Family therapy (FT) is based on family systems theory and emphasizes the role of the family context in an individual's emotional functioning (Bowen 1966). There are several types of FT, including structural FT (Minuchin 1974), strategic FT (Haley 1976), and behavioral systems FT (Robin 1989). Treatment aims to alter maladaptive patterns of interaction within the family in order to improve symptoms.

Motivational interviewing (MI) focuses on the patient's motivation for and commitment to behavior change. Specific strategies include exploring and resolving ambivalence, rolling with resistance, and eliciting and supporting the patient's own arguments for change (Miller 1983; Miller 2013). A unique feature of MI is the focus on the patient's own values and goals, as opposed to imposing external values and strategies for change.

Multisystemic therapy (MST) is an intensive family- and community-based intervention founded in the social ecological model (Bronfenbrenner 1979), and family systems theory (Bowen 1966; Haley 1976; Minuchin 1974). Treatment targets of MST are broad and include the child, their family, and broader systems such as the child's school or medical team. MST incorporates a wide range of intervention techniques based on the individual needs of the child and family (Henggeler 2003), including cognitive and behavioral skills training, parent operant training, and family therapy.

Problem-solving therapy (PST) is based on the social-problem-solving model (D'Zurilla 1971; D'Zurilla 1982; D'Zurilla 1999), which emphasizes the role of constructive problem-solving attitudes and skills in fostering enhanced social competence and reduced emotional distress. Specific problem-solving skills are taught in sequential steps that typically include defining the problem, generating alternative solutions, decision making, and solution implementation and evaluation (D'Zurilla 2007).

Why it is important to do this review

Children's adaptation to chronic illness occurs within the context of the parent-child relationship, the family system, and the broader community. There are likely bi-directional relationships between parent functioning (parental behavior, mental health),

child functioning (child behavior/disability, mental health, medical symptoms) and family functioning (e.g. family conflict/cohesion) that may impact the child's adaptation to, and management of, their medical condition. Psychological interventions for parents of children with chronic medical conditions focus on improving parent mental health and well-being of children, and the family system. Establishing the evidence at this stage of development can guide clinical practice and future research development.

OBJECTIVES

To evaluate the efficacy and adverse events of psychological therapies for parents of children and adolescents with a chronic illness.

METHODS

Criteria for considering studies for this review

Types of studies

Eligible study designs met the following criteria.

- Randomized controlled trials (RCTs), published in full in a peer-reviewed journal
- The primary aim of the study was to evaluate an intervention that was predominantly psychological in nature and that was delivered to parents.
- For this update, in order to enhance the quality of included studies and interpretability of results of the review, studies were required to have at least 20 participants per arm post-treatment or follow-up.
- Reported quantitative outcomes. Exclusively qualitative studies were excluded from this review.

Types of participants

Eligible participants met the following criteria.

- Parents were operationally defined as primary caregivers who were responsible for parenting the child, including (but not limited to) biological parents, guardians, and other adult family members.
- Children and adolescents, aged three months to 19 years, with one of the following chronic medical conditions that had an expected duration of at least three months:
  * asthma;
  * cancer (including newly diagnosed patients, patients in active treatment, and survivors);
  * chronic pain conditions (including but not limited to arthritis, back pain, complex regional pain syndrome, fibromyalgia, headache, idiopathic pain conditions, irritable bowel syndrome, migraine, recurrent abdominal pain);
  * diabetes mellitus;
  * gynaecological disorders (e.g. chronic dysmenorrhea, endometriosis);
  * inflammatory bowel diseases (IBD);
  * skin diseases (e.g. eczema);
  * traumatic brain injury (TBI).

We selected chronic illnesses from the list of 'Current Health Conditions and Functional Difficulties' from the National Survey of Children with Special Health Care Needs 2009 to 2010 (Data Resource Center 2010). It was impractical to include all chronic illnesses on this list; therefore we selected the most common. For the purposes of this review, we also included three additional illnesses: cancer, inflammatory bowel diseases and gynaecological disorders. Cancer has a high incidence level, and in the UK alone 1821 children aged 0 to 14 years are diagnosed with cancer each year (Cancer Research UK 2018). In the USA, it is estimated that 15,270 children aged 0 to 19 years are diagnosed with cancer (National Cancer Institute 2018). IBD and gynaecological disorders are also common conditions in childhood and adolescence.

Types of interventions

We included interventions that were primarily psychological, had credible and recognizable psychological/psychotherapeutic content, and were delivered to parents. In this update, we included interventions that combined psychological and pharmacological treatments. We included comparison groups that received either non-psychological treatment (e.g. psychoeducation), treatment as usual (e.g. standard medical care without added psychological therapy), or wait-list.

We excluded interventions that used parents as 'coaches' to support exclusively child-focused treatments, as well as those that were primarily health promotion interventions (e.g. smoking cessation treatments for parents of children with asthma).

Types of outcome measures

We extracted means, standard deviations, and numbers used in analyses for all available treatment outcomes post-treatment and at the first-available follow-up. We transcribed adverse events verbatim from the published manuscripts.

When studies reported multiple measures within an outcome domain, we extracted the most generic, reliable, appropriate, and frequently used measure within the field. When both parents and children reported on a measure, we preferentially extracted child self-report data. For measures of family functioning, we preferentially extracted parent-reported data.

Primary outcomes

Our main outcomes were parenting behavior (e.g. self-report measures of behavioral responses to their child, such as overprotective or solicitous behaviors), and parent mental health (e.g. self-report measures of anxiety, depression).

Secondary outcomes

Our secondary outcomes were child behavior/disability (e.g. self-report measures of functional disability, school attendance), child mental health (e.g. self-report measures of anxiety, depression, oppositional behavior), child medical symptoms (e.g. objective measures of medical symptoms, such as HbA1c scores for youth with diabetes), family functioning (e.g. self-report measures of family conflict, family cohesion, family communication), and adverse events.

Search methods for identification of studies

We have conducted three searches for this review: 1) from inception to March 2012, 2) from March 2012 to July 2014, and 3) from July

2014 to July 2018. Below, we list all sources searched including databases, trials registers, and other resources.

Electronic searches

We searched four electronic databases for this update:

- Cochrane Central Register of Controlled Trials (CENTRAL) via CRSO, inception to 16 July 2018;
- MEDLINE via Ovid, 1946 to 17 July 2018;
- Embase via Ovid, 1974 to 16 July 2018;
- PsycINFO via Ovid, 1806 to 16 July 2018.

We adapted the search strategies from the MEDLINE search (for all search strategies see Appendix 1). In order to include only the highest quality studies, we did not impose a language restriction and we did not include unpublished literature or grey material. We included four categories of words in the search strategy: psychological interventions, parents, children and adolescents, and chronic illnesses (as stated above), which were refined by a methodological filter used to identify RCTs according to Cochrane guidance (Lefebvre 2011).

Searching other resources

We checked reference lists of and performed a citation search for all included studies and relevant meta-analyses and systematic reviews identified via our electronic searches. We searched online trials registries up to July 2018 including metaRegister of controlled trials (mRCT; www.isrctn.com/page/mrct), ClinicalTrials.gov (clinicaltrials.gov), and the World Health Organization International Clinical Trials Registry Platform (ICTRP; www.who.int/ictrp/en/). Search terms for trials registries included: psychological interventions, parents, children, adolescents, and chronic illness (as stated above). We contacted authors of selected studies and experts in the field for unpublished and ongoing studies.

Data collection and analysis

Selection of studies

Two review authors (EF, EL) independently conducted the selection of studies including screening titles and abstracts, and full-text manuscripts. A third author (TP) served as arbiter. We selected studies by reviewing full texts of manuscripts identified from the updated abstract search. We resolved any disagreements by discussion between review authors.

Our included studies met the following criteria.

Participants:

- the title or abstract referred to parents;
- children had one or more of the chronic illnesses listed above;
- children were 3 months to 19 years of age;
- there were 20 or more participants in each arm of the study at immediate post-treatment or follow-up;
- the parent had to be the primary caregiver of the child.

Intervention:

- the intervention was primarily psychological in at least one treatment arm;
- design was a RCT;
- treatment was delivered to one or more parents;
- outcome assessments were completed by the parent, the child, or both.

Comparison groups:

- active, non-psychological treatment (e.g. psychoeducation);
- treatment-as-usual (e.g. usual doctors' appointments and treatment without added psychological therapy);
- wait-list.

Outcomes:

- at least one outcome measure was quantitative.

Data extraction and management

Data collection process

Two review authors (EL, EF) independently conducted data extraction using the ProForma we developed for prior versions of this review. We resolved any disagreements by discussion between review authors.

Requests for data

We contacted authors of studies when data were not reported fully in the published manuscripts. We contacted study authors via email twice during a one-month period.

Data items

We extracted participant demographics, chronic illness characteristics, therapy characteristics, treatment outcomes, and adverse events (transcribed verbatim from the published manuscripts).

Transformations of data

We did not conduct any transformations of data. We used means and standard deviations for all meta-analyses of treatment outcomes.

Assessment of risk of bias in included studies

We assessed risk of bias based on the methods reported in the published manuscripts using the recommended Cochrane guidance (Higgins 2017). We evaluated five of the six suggested 'Risk of bias' categories: random sequence generation (selection bias), allocation concealment (selection bias), blinding of outcome assessment (detection bias), incomplete outcome data (attrition bias) and selective reporting (reporting bias). We excluded the category of 'blinding participants and personnel' because it is not possible to blind personnel who are delivering psychological treatments.

Sequence generation

We judged studies to have low risk of bias if an adequate random sequence generation method was reported, such as using a random numbers table or a computerized random numbers generator. We judged studies to have unclear risk of bias when sequence generation procedures were not reported in the published manuscript. We judged studies to have high risk of bias when a non-random approach to sequence generation was

reported, such as assigning participants sequentially or based on date of birth. Stratification of participants (e.g. by age or sex) did not count as biased as long as a random sequence generation method was reported.

Allocation concealment

We judged studies to have low risk of bias if a third party not involved in participant recruitment/enrollment allocated participants to treatment groups or if an alternative adequate allocation method was described (e.g. use of a locked electronic file to store the allocation sequence, use of sealed opaque envelopes that are sequentially numbered according to the allocation sequence, or use of centralized automated telephonic or computerized assignment systems). We judged studies to have unclear risk of bias if procedures for allocation were not described. We judged studies to have high risk of bias when procedures for allocation concealment were not used (e.g. the person recruiting/enrolling participants would have been able to foresee treatment group assignments).

Detection bias

We judged studies to have low risk of bias when outcome assessments were administered by an assessor who was blind to the treatment allocation, or when measures were completed by participants in their homes and submitted either online or via postal mail. We judged studies to have unclear risk of bias if the method for blinding study staff during outcome assessments was not described. We judged studies to have high risk of bias when blinding was not used during outcome assessments (e.g. outcome assessments were administered by the participant's study therapist) or if it was likely that the blinding could have been broken.

Attrition bias

We assigned a low risk of bias when attrition was reported (e.g. via a participant flow diagram) and when the authors reported that characteristics of participants who completed the study and those who were lost to follow-up did not differ between the treatment groups. We assigned an unclear risk of bias when an inadequate description of attrition was provided (i.e. attrition was reported but comparisons between the treatment groups were not reported) or attrition was not clearly described.

Reporting bias

We assessed outcome reporting bias based on whether the results of the published manuscript included data for all outcomes described in the Methods. We assigned a low risk of bias when data for all outcomes were fully reported at all time points in the published manuscript (i.e. number of participants, means, standard deviations), an unclear risk of bias when insufficient information was reported to make a judgement, and high risk of bias when outcomes data were not fully reported in the published manuscript. When outcome data were not fully reported, we requested these data from the study authors via email. When data were not fully reported in the manuscript, we assessed reporting bias as high regardless of whether study authors responded to our data request.

Measures of treatment effect

We extracted data immediately post-treatment (i.e. immediately after the treatment program had finished). When studies had repeated follow-up observations on participants, we extracted data from the first available follow-up time point only, because we considered this to be the most clinically relevant time point, per the guidelines provided in chapter 9 of the *Cochrane Handbook for Systematic Reviews of Interventions* (9.3.4; Deeks 2017).

We categorized outcomes into one of six outcome domains: parenting behavior, parent mental health, child behavior/disability, child mental health, child symptoms and family functioning. Where studies had more than one comparator group, we chose the 'active control group' over 'standard treatment' or 'wait-list control' groups.

There are four therapies (CBT, FT, PST and MST), eight medical conditions (asthma, cancer, diabetes mellitus, gynecological disorders, inflammatory bowel diseases, painful conditions, skin diseases, and traumatic brain injury), two time points (post-treatment and follow-up) and six possible outcomes (parenting behavior, parent mental health, child behavior/disability, child mental health, child symptoms and family functioning). There are six categories by which we sought to analyze data.

- For each condition, across all types of psychological therapy, what is the efficacy for the six outcomes immediately post-treatment?
- For each condition, across all types of psychological therapy, what is the efficacy for the six outcomes at follow-up?
- For each psychological therapy, across all conditions, what is the efficacy for the six outcomes post-treatment?
- For each psychological therapy, across all conditions, what is the efficacy for the six outcomes at follow-up?
- The interaction between the condition and the efficacy of the psychological therapy
- Investigaton of characteristics of particularly effective treatments

We have presented analyses for each of the six outcomes, however, due to the heterogeneous nature of the conditions and studies, this was not always possible.

Unit of analysis issues

For all included studies, randomization occurred at the level of the individual. Most studies used parallel-group designs; one study used a cross-over design (Kashikar-Zuck 2012). There were no cluster-randomized trials. There were seven studies that had three study arms (Ellis 2017a; Greenley 2015; Levy 2017; Seid 2010; Wade 2017; Wysocki 1999; Wysocki 2006). For studies with two intervention groups, we combined these for analysis in order to create a single pair-wise comparison per the guidelines and methods provided in Chapter 16.5.4 (Higgins 2011a), and Chapter 7.3.8 (Higgins 2011b), of the *Cochrane Handbook for Systematic Reviews of Interventions*. For studies with two control groups, we extracted data from the active control condition for analyses.

Dealing with missing data

We contacted authors of studies where outcome data were not reported fully in publications (i.e. means or standard deviations for

outcomes were missing). However, when study authors could not provide the data or were not-responsive to emails, we excluded those studies from analyses.

Assessment of heterogeneity

We used the I^2 statistic to assess statistical heterogeneity, per the guidelines provided in Chapter 9.5.2 of the *Cochrane Handbook for Systematic Reviews of Interventions* (Deeks 2017).

Assessment of reporting biases

We planned to use funnel plots to assess reporting biases per the guidelines provided in Chapter 10.4 of the *Cochrane Handbook for Systematic Reviews of Interventions* (Sterne 2017). However, the data were not of sufficient quality or quantity to allow for this assessment.

Data synthesis

We pooled data using the standardized mean difference (SMD) and a random-effects model. We chose to use a random-effects model due to several potential sources of heterogeneity including inconsistency between studies in types of comparator conditions (i.e. active versus wait-list control conditions), variability between studies in types of outcome assessment measures, inclusion of different therapy types in analyses evaluating the effect of psychological treatments for each medical condition, and inclusion of different medical conditions when evaluating the effect of each psychological therapy type. Cohen's d effect sizes can be interpreted as follows: 0.2 = small, 0.5 = medium, 0.8 = large (Cohen 1988). P values were not corrected for the multiple meta-analytic comparisons conducted in this review. We used Review Manager 5 (RevMan 5) to conduct analyses (Review Manager 2014).

When studies evaluated more than one psychological treatment that met our eligibility criteria (e.g. three-armed RCTs with two treatment arms and one comparator), we averaged outcome data across the two treatment arms. When studies had more than one comparator control condition, we preferentially extracted outcome data from the active comparator control condition over treatment as usual and wait-list control conditions.

Quality of the evidence

Two review authors (EL, EF) independently rated the quality of the outcomes. We used the GRADE system to rank the quality of the evidence using the RevMan 5 'Summary of findings' table, and the guidelines provided in Chapter 11 of the *Cochrane Handbook for Systematic Reviews of Interventions* (Schünemann 2017).

The GRADE approach uses five considerations (study limitations, consistency of effect, imprecision and publication bias) to assess the quality of the body evidence for each outcome. Quality level ratings range from high to very low, and are interpreted as follows:

- High: we are very confident that the true effect lies close to that of the estimate of the effect;
- Moderate: we are moderately confident in the effect estimate; the true effect is likely to be close to the estimate of effect, but there is a possibility that it is substantially different;
- Low: our confidence in the effect estimate is limited; the true effect may be substantially different from the estimate of the effect;
- Very low: we have very little confidence in the effect estimate; the true effect is likely to be substantially different from the estimate of effect.

The GRADE system uses the following criteria for assigning a quality level to a body of evidence (Chapter 11, Schünemann 2017).

- High: randomized trials; or double-upgraded observational studies
- Moderate: downgraded randomized trials; or upgraded observational studies
- Low: double-downgraded randomized trials; or observational studies
- Very low: triple-downgraded randomized trials; or downgraded observational studies; or case series/case reports

Factors that may decrease the quality level of a body of evidence are:

- limitations in the design and implementation of available studies suggesting high likelihood of bias;
- indirectness of evidence (indirect population, intervention, control, outcomes);
- unexplained heterogeneity or inconsistency of results (including problems with subgroup analyses);
- imprecision of results (wide confidence intervals);
- high probability of publication bias.

Factors that may increase the quality level of a body of evidence are:

- large magnitude of effect;
- all plausible confounding would reduce a demonstrated effect or suggest a spurious effect when results show no effect;
- dose-response gradient.

For this update, we decreased the grade rating by one (-1) or two (-2) (up to a maximum of -3 to 'very low') if we identified the following.

- Limitations in study design/implementation: we decreased the grade rating by one (-1) when more than 50% to 75% of the 'Risk of bias' ratings from the studies in the analysis were 'unclear' or 'high' risk of bias, and by two (-2) when more than 75% of 'Risk of bias' ratings were 'unclear' or 'high'.
- Indirectness of evidence: we decreased the grade rating by one (-1) when 50% to 75% of studies included in the analysis had a wait-list control condition, and by two (-2) when 75% or more of the studies had a wait-list control condition.
- Heterogeneity/inconsistency of results: we decreased the grade rating by one (-1) when the heterogeneity of the analysis was between 46% to 65% and by two (-2) when the heterogeneity was more than 65%.
- Imprecision of results: we decreased the grade rating by one (-1) when the analysis included fewer than 500 participants or if there were wide confidence intervals, and by two (-2) when the number of participants included in the analysis was very low or if confidence intervals were very wide.
- High probability of publication bias: we decreased the grade rating by one (-1) when the outcome domain for the analysis was not assessed in 50% to 75% of studies that could have been included in the analysis, and by two (-2) when more than 75% of studies that could be included in the study did not provide data.

'Summary of findings' tables

We have included four 'Summary of Findings' tables to present primary findings from this review reflecting the interventions that are most commonly delivered in clinical practice and therefore potentially most relevant to providers and patients: 1) CBT compared to any control condition for parents of children with chronic medical illness at post-treatment (Summary of findings 1), and follow-up (Summary of findings 2), and 2) PST compared to any control condition for parents of children with chronic medical illness at post-treatment (Summary of findings 3), and follow-up (Summary of findings 4). We included key information concerning the quality of evidence, the magnitude of effect of the interventions examined, and the sum of available data on the outcomes parenting behavior, parent mental health, child behavior/disability, child mental health, child medical symptoms, and family functioning. We report the most important reasons for downgrading in the text and 'Summary of findings' tables.

Subgroup analysis and investigation of heterogeneity

We investigated heterogeneity by conducting subgroup analyses to compare intervention effects between studies that used an active control condition versus a wait-list control condition. We conducted subgroup analyses only when there were at least 10 studies included in the meta-analysis, per the guidelines provided in Chapter 9.6.5.1 of the *Cochrane Handbook for Systematic Reviews of Interventions* (Deeks 2017).

Sensitivity analysis

For analyses with at least 10 studies, we conducted sensitivity analysis by comparing intervention effects between studies with a high risk of selective reporting bias (i.e. outcomes were not fully reported in the published manuscript) versus studies with an unclear or low risk of selective reporting bias. We chose to focus on selective reporting bias for our sensitivity analysis because of the relatively large proportion of published studies in this field with incomplete outcome reporting. Prior versions of this review have consistently identified high selective reporting bias whereas the other types of biases have been rated as low or unclear.

RESULTS

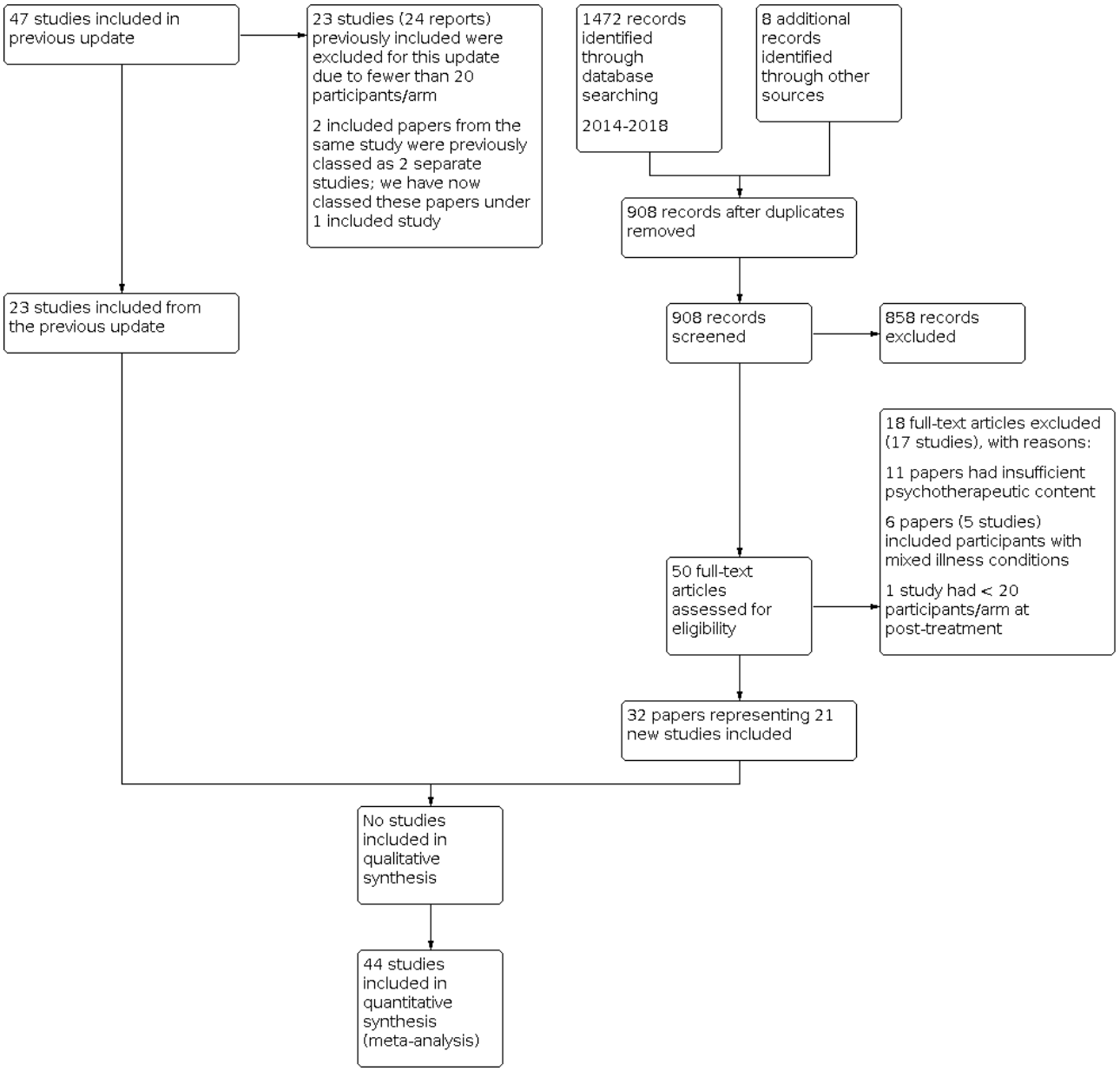
Description of studies

See Characteristics of included studies and Characteristics of excluded studies for a detailed description of included and excluded studies.

Results of the search

See Figure 1 for the study flow diagram.

Figure 1. Study flow diagram



For the initial version of this review, we conducted the first search from inception of databases to March 2012 and identified 35 studies for inclusion. For the first update of the review we conducted a search from March 2012 to July 2014 and identified an additional 13 studies for inclusion. For a detailed description of these searches, see Appendix 2.

This is the second update of this review and we conducted our updated search from July 2014 to July 2018, which yielded 908 unique abstracts that we screened for inclusion. We read 50 papers in full, 18 papers (17 studies) of which we excluded. The remaining 32 papers represented 21 new studies which are now included in this update (Bonnert 2017; Daniel 2015; Doherty 2013; Ellis 2017a; Ellis 2017b; Greenley 2015; Husted 2014; Law 2015; Levy 2016; Levy 2017; Mayer-Davis 2015; May 2017; Morawska 2016; Palermo 2016a; Palermo 2016b; Powers 2013; Tsitsi 2017; Wade 2014; Wade 2017; Westrupp 2015; Yeh 2016). Consistent with the change in our protocol, we retained 23 studies from the previous review that had a sample size of more than 20 participants per treatment arm at immediate post-treatment or follow-up (Ambrosino 2008; Ellis 2005; Ellis 2012; Hoekstra-Weebers 1998; Kashikar-Zuck 2012; Kazak 2004; Laffel 2003; Levy 2010; Naar-King 2014; Nansel 2009; Nansel 2012; Palermo 2009; Robins 2005; Sahler 2002; Sahler 2005; Sahler 2013; Sanders 1994; Seid 2010; Stark 2005; Stehl 2009; Wade 2006a; Wysocki 1999; Wysocki 2006). Two manuscripts from one study had previously been analyzed as two separate studies, and for this update both manuscripts were classed into a single study (Sahler 2013). Therefore, this update includes a total of 44 studies.

Included studies

See Characteristics of included studies for a detailed summary. The 44 included studies randomized 5224 participants, and 4697

participants completed the immediate post-treatment assessment. Thus, the completion rate for all studies was 85%, and the attrition rate was 15%. The average age of children receiving treatment was 11.5 years (range = 3 months to 18 years).

As shown in Table 1, the majority of studies evaluated interventions developed for parents of children with cancer (7 studies), chronic pain (13 studies), or diabetes (15 studies). In comparison, very few studies meeting our inclusion criteria evaluated interventions for parents of children with asthma (4 studies), IBD (2 studies), skin diseases (1 study), or TBI (3 studies). We did not identify any studies of children with gynecological disorders. We also categorized studies by psychological therapy type. The majority of studies evaluated CBT interventions (21 studies) and PST interventions (12 studies). Relatively few studies meeting our inclusion criteria evaluated FT (4 studies), MI (3 studies), or MST (4 studies). Control conditions were primarily treatment-as-usual control conditions (20 studies) and active control conditions (e.g. psychoeducation; 18 studies), with a minority of studies using wait-list control conditions (6 studies). Treatment dose for parents ranged from one to 48 sessions (median = 5 sessions) and from zero to 48 sessions for children (median = 3 sessions). The proportion of therapy delivered to parents versus children varied between studies. Most studies delivered an equal amount of treatment to parents and children (27 studies); in 12 studies only the parent received therapy.

Treatment was delivered face-to-face with a therapist in 25 studies (see Table 1). There were several studies that used a hybrid approach to treatment delivery including eight studies that delivered treatment face-to-face and via telephone sessions (Daniel 2015; Ellis 2012; Greenley 2015; Nansel 2009; Nansel 2012; Palermo 2016a; Sahler 2002; Stehl 2009). In 10 studies, all treatment sessions were delivered remotely, including eight studies that delivered treatment via the internet (Bonnert 2017; Ellis 2017a; Law 2015; Palermo 2009; Palermo 2016b; Wade 2006a; Wade 2014; Wade 2017), one study that delivered treatment via an audio CD (Tsitsi 2017), and one study that delivered treatment via a self-help workbook (Doherty 2013). There was one study that directly compared face-to-face versus telephone-delivery (Levy 2010).

Treatment was delivered to individuals, families, and groups either in outpatient clinics or in participants' homes. Follow-up assessments were conducted in 25 studies; for the majority of studies, the first available follow-up assessments were conducted at three months (6 studies) or five to six months (10 studies), with the remaining nine studies at nine to 12 months. Funding sources included federal and state agencies, private foundations, hospitals, and universities. In Table 2, we present a narrative summary of the treatment content for each included study.

Excluded studies

See Characteristics of excluded studies for a detailed description of 113 excluded studies, including 73 studies (78 papers) that were previously excluded, 23 studies (24 papers) from the prior review that did not meet our inclusion criteria primarily due to insufficient sample size, and 17 new studies (18 papers) identified in this update. Judgements about whether to exclude studies were often difficult to make and we resolved them via discussion between review authors. Here we provide our rationale for excluding studies and provide examples of studies that readers may expect to find in this review but were excluded.

- We excluded studies because the intervention had insufficient psychotherapeutic content, including educational interventions, interventions where parents were trained as 'coaches' for their children, and health promotion interventions (e.g. Barrera 2018a; Brown 2014; Canino 2016; Halterman 2014; Manne 2016; Rapoff 2014; Scholten 2015).
- We also excluded studies because the aim of the study was not relevant to the objectives of this review, including feasibility studies and studies of mixed samples of youth that did not report outcomes separately by medical condition (e.g. Fedele 2013; Hommel 2012; Mortenson 2016; Wade 2010; Wysocki 1997).
- For this update, we excluded 23 previously included studies because the sample size per treatment arm was fewer than 20 participants post-treatment or at follow-up (Allen 1998; Antonini 2014; Barakat 2010; Barry 1997; Celano 2012; Connelly 2006; Duarte 2006; Ellis 2004; Gulewitsch 2013; Hicks 2006; Kashikar-Zuck 2005; Lask 1979; Lehmkuhl 2010; Marsland 2013; Mullins 2012; Ng 2008; Niebel 2000; Olivares 1997; Saßman 2012; Shekarabi-Ahari 2012; Tsiouli 2014; Wade 2006b; Wade 2011).

Risk of bias in included studies

We judged the majority of included studies to have either low or unclear risk of bias across domains except for selective reporting bias, which we judged to be high risk in 19 of the 44 studies (43%) (Figure 2; Figure 3). A narrative summary is provided below.

Figure 2. 'Risk of bias' summary: review authors' judgements about each risk of bias item for each included study

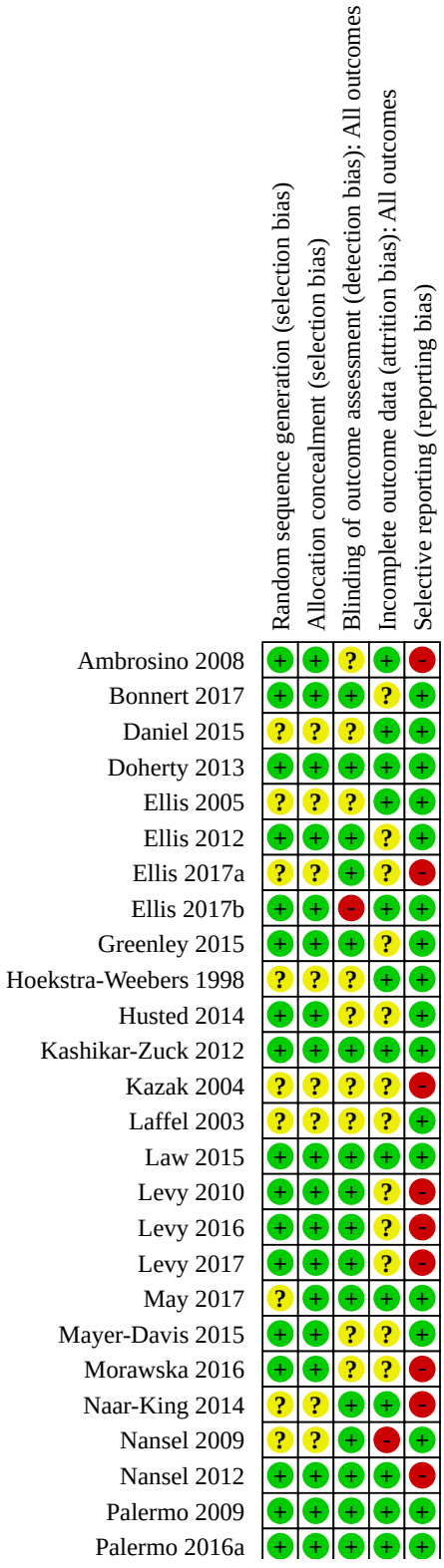


Figure 2. (Continued)

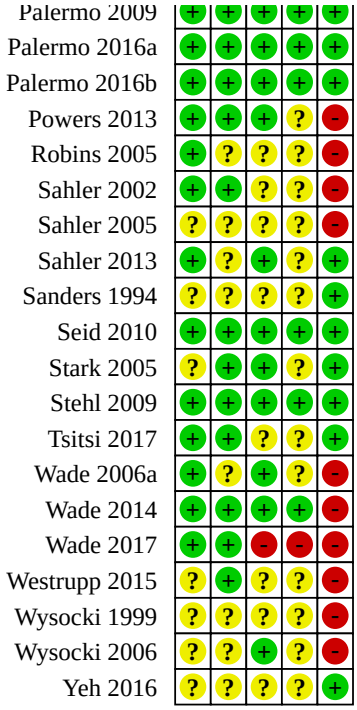
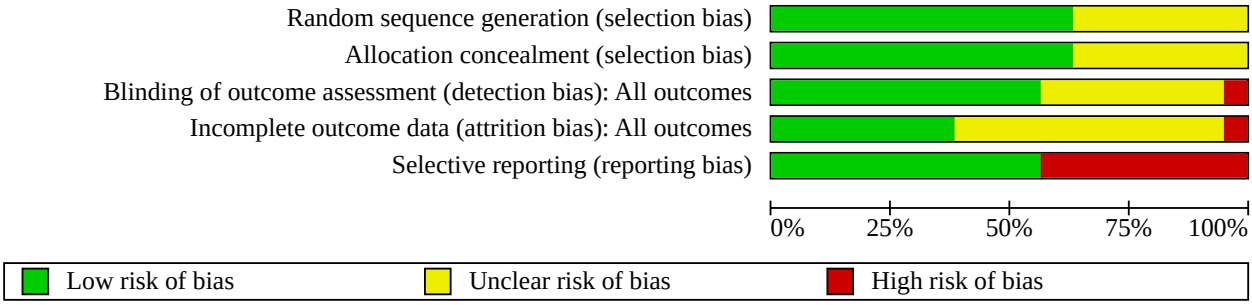


Figure 3. 'Risk of bias' graph: review authors' judgements about each risk of bias item presented as percentages across all included studies



Allocation

Random sequence generation

Twenty-eight studies described a convincing method of randomization and we judged these as low risk of bias. In the remaining 16 studies, selection bias was unclear because they did not provide an adequate description. Due to our inclusion criteria that all studies had to be RCTs, we did not give any studies a rating of high risk of bias for randomization.

Allocation concealment

For allocation bias, we judged 28 studies to be low risk because they described a convincing method of allocation. The remaining 16 studies did not provide an adequate description and therefore we judged these studies as unclear. We did not rate any studies as having a high risk of allocation bias.

Blinding

We judged 25 studies to have low risk of detection bias because the study procedures specified that assessments were submitted online or via postal mail, or were completed face-to-face with an outcome assessor who was blinded to treatment allocation. Seventeen studies did not provide an adequate description and we judged these as unclear. We rated two studies as having a high risk of detection bias because the outcome assessor was not blinded to treatment allocation.

We did not assess performance bias because it is not possible to blind personnel who are delivering psychological treatments.

This means that studies should be presumed to be at risk for performance bias.

Incomplete outcome data

We judged 16 studies as low risk of attrition bias because they reported attrition, and there were no significant differences between completers and non-completers in the two treatment groups. We rated 25 studies as unclear because the information that they provided was inadequate to allow us to make a judgement (e.g. they reported attrition but did not conduct comparisons between completers and non-completers). We judged two studies as high risk because either they did not report attrition or because they did report attrition and their were differences between completers and non-completers.

Selective reporting

We judged 25 studies as low risk of selective reporting bias because they presented all of the outcome data required for extraction in the published papers. We rated 19 studies as high risk of selective reporting bias because they did not fully report their data in the published papers. For these studies, we rated selective reporting bias as high regardless of whether the authors responded to our request for data. For 15 of these 19 studies, the authors provided data on request and we included these studies in our analyses (Ambrosino 2008; Ellis 2017a; Levy 2010; Levy 2016; Levy 2017; Morawska 2016; Naar-King 2014; Nansel 2012; Powers 2013; Sahler 2002; Sahler 2005; Wade 2006a; Wade 2014; Wade 2017; Westrupp 2015). We conducted sensitivity analyses to examine the effect of these studies with high risk of selective reporting bias on our findings.

Effects of interventions

See: **Summary of findings 1** Cognitive-behavioral therapy for parents of children with a chronic illness (post-treatment); **Summary of findings 2** Cognitive-behavioral therapy for parents of children with a chronic illness (follow-up); **Summary of findings 3** Problem-solving therapy for parents of children with a chronic illness (post-treatment); **Summary of findings 4** Problem-solving therapy for parents of children with a chronic illness (follow-up)

We conducted two sets of analyses to address the following questions.

- For each medical condition, across all types of psychotherapy, what is the efficacy for each outcome immediately post-treatment and at follow-up?
- For each type of psychological therapy, across all medical conditions, what is the efficacy for each outcome immediately post-treatment and at follow-up?

For analyses, we combined studies of children with IBD with studies of children with chronic pain conditions. There were no studies of children with gynecologic conditions. We included 40 studies (4503 participants post-treatment) in at least one analysis. We were not able to include four studies in any of the analyses because they either did not assess or did not provide means or standard deviations for the outcomes analyzed in this review (Greenley 2015; Kazak 2004; Robins 2005; Stark 2005). Stark 2005 provided outcome data on calcium intake; however, this was heterogeneous with other outcomes we extracted for this condition and therapy type, and therefore we determined that this study was not appropriate to include in the meta-analysis.

Medical conditions across all psychological therapies

Asthma

Four studies (506 participants) evaluated the effect of psychological therapies for parents of children with asthma (Morawska 2016; Naar-King 2014; Seid 2010; Yeh 2016). All four studies used active comparator conditions. We were not able to conduct our planned subgroup analyses to investigate heterogeneity due to the small number of studies included in the primary analyses.

- We were not able to draw conclusions about the effects of psychological therapies on parenting behavior or parent mental health post-treatment or at follow-up due to the small number of studies included in the analyses. Only two studies reported parenting behavior post-treatment (209 participants; Morawska 2016; Naar-King 2014), and only one study reported parent mental health post-treatment and at follow-up (65 participants; Yeh 2016). We judged the quality of evidence for parenting behavior and parent mental health to be very low; we downgraded these outcomes twice for imprecision (small number of participants) and once for high probability of publication bias.
- Three studies reported on the effect of psychological therapies on children's asthma symptoms, and results indicated that there was no evidence of a beneficial treatment effect post-treatment (SMD −0.16, 95% CI -0.63 to 0.31; participants = 337; studies = 3; I^2 = 77%; Analysis 1.4), and there were only two studies at follow-up (160 participants; Seid 2010; Yeh 2016). We judged the quality of evidence for this outcome as very low at post-treatment and follow-up; we downgraded twice for heterogeneity, and once for imprecision (small number of participants). Heterogeneity was high, indicating that there may be considerable inconsistency in the results between the small number of studies included in these analyses.
- We were unable to draw conclusions about the effect of psychological therapies on other outcomes for children with asthma due to the small number of included studies. No studies reported on child behavior/disability, and only one study reported on child mental health at post-treatment (41 participants; Morawska 2016). We judged the quality of evidence for child outcomes to be very low; we downgraded once for limitations of study design/implementation and twice for imprecision (small number of participants).
- Regarding family functioning, we were not able to draw conclusions due to the small number of studies included in the analyses. Only two studies reported family functioning post-treatment and at follow-up (104 participants; Morawska 2016; Yeh 2016). We judged the quality of evidence for family functioning at both time points to be very low; we downgraded once for limitations of study design/implementation and twice for imprecision (small number of participants).

Cancer

Seven studies (991 participants) evaluated the effect of psychological therapies for parents of children with cancer; six studies used active control conditions (Hoekstra-Weebers 1998; Sahler 2002; Sahler 2005; Sahler 2013; Stehl 2009; Tsitsi 2017), and one used a wait-list control condition (Kazak 2004). We were

not able to conduct our planned subgroup analyses to investigate heterogeneity due to the small number of studies included in the primary analyses.

- Psychological therapies had a small beneficial effect on parenting behavior post-treatment (SMD −0.28, 95% CI −0.43 to −0.13; participants = 664; studies = 3; I^2 = 0%; Analysis 3.1), and this small effect was maintained at follow-up (SMD −0.21, 95% CI −0.37 to −0.05; participants = 625; studies = 3; I^2 = 0%; Analysis 4.1). There was no heterogeneity. We rated the quality of evidence for parenting behavior as low at both time points; we downgraded once due to high probability of publication bias and once for limitations of study design/implementation.
- Parent mental health also improved in response to psychological therapies post-treatment (SMD −0.21, 95% CI −0.35 to −0.08; participants = 836; studies = 6; I^2 = 0%; Analysis 3.2), which was a small effect size and this was maintained at follow-up (SMD −0.23, 95% CI −0.39 to −0.08; participants = 667; studies = 4; I^2 = 0%; Analysis 4.2). There was no heterogeneity. We judged the quality of evidence for parent mental health as high at post-treatment. At follow-up, we judged the quality of evidence as moderate, downgraded once due to limitations of study design/implementation.
- There were no studies of psychological therapies for parents of children with cancer that presented extractable data on child mental health, child behavior/disability, child symptoms, or family functioning post-treatment or at follow-up.

Chronic pain conditions

Fifteen studies (1595 participants) evaluated the effect of psychological therapies for parents of children with chronic pain conditions (Bonnert 2017; Daniel 2015; Greenley 2015; Kashikar-Zuck 2012; Law 2015; Levy 2010; Levy 2016; Levy 2017; Palermo 2009; Palermo 2016a; Palermo 2016b; Powers 2013; Robins 2005; Sanders 1994; Stark 2005). Four of these studies used wait-list control comparator conditions (Bonnert 2017; Daniel 2015; Greenley 2015; Palermo 2009), and the remaining 11 studies used active control conditions. When there were 10 or more studies included in the primary analysis, we conducted our planned subgroup analyses to investigate heterogeneity by evaluating only studies that used an active control comparator condition. We were not able to conduct our planned subgroup analyses to evaluate only studies with a wait-list control condition due to the small number of available studies. There were four studies with high risk of selective reporting bias that we included in analyses of child behavior and disability (Levy 2010; Levy 2016; Levy 2017; Powers 2013); see 'Sensitivity analyses' below for results from subgroup analyses evaluating the effect of these studies on our findings.

- We found a small beneficial effect of treatment on parenting behavior post-treatment (SMD −0.29, 95% CI −0.47 to −0.10; participants = 755; studies = 6; I^2 = 34%; Analysis 5.1), which was maintained at follow-up (SMD −0.35, 95% CI −0.50 to −0.20; participants = 678; studies = 5; I^2 = 1%; Analysis 6.1). We judged the quality of this evidence as moderate. We downgraded evidence once at each time point due to high probability of publication bias.
- Parent mental health also improved in response to psychological therapies post-treatment (SMD −0.24, 95% CI −0.42 to −0.06; participants = 490; studies = 3; I^2 = 0%; Analysis 5.2), and follow-up (SMD −0.20, 95% CI −0.38 to −0.02; participants = 482; studies = 3; I^2 = 0%; Analysis 6.2), which were small effects. We judged this evidence to be low quality; we downgraded evidence twice at each time point, once due to high probability of publication bias and once due to imprecision (small number of participants).
- Regarding children's treatment outcomes, we found a small beneficial effect of treatment on child behavior/disability at post-treatment (SMD −0.15, 95% CI −0.28 to −0.01; participants = 1362; studies = 12; I^2 = 33%; Analysis 5.3), and this was maintained at follow-up (SMD −0.27, 95% CI −0.39 to −0.15; participants = 1099; studies = 9; I^2 = 0%; Analysis 6.3). We judged this evidence to be high quality at post-treatment and follow-up. We conducted subgroup analysis to investigate heterogeneity at post-treatment. When we included only studies with an active control condition in the analysis, we found that there was no longer evidence of a beneficial effect of treatment and heterogeneity was lower (SMD −0.13, 95% CI −0.26 to 0.00; participants = 1154; studies = 9; I^2 = 18%).
- We did not find evidence of a beneficial treatment effect on child mental health post-treatment (SMD −0.02, 95% CI −0.13 to 0.09; participants = 1314; studies = 11; I^2 = 0%; Analysis 5.4) or at follow-up (SMD −0.02, 95% CI −0.14 to 0.09; participants = 1108; studies = 9; I^2 = 0%; Analysis 6.4). We did not conduct subgroup analysis because there was no heterogeneity. We judged this evidence as high quality at post-treatment and follow-up.
- We found a moderate beneficial effect of psychological therapies on children's pain symptoms post-treatment (SMD −0.44, 95% CI −0.84 to −0.03; participants = 1161; studies = 10; I^2 = 91%; Analysis 5.5). Heterogeneity was high. When we conducted subgroup analysis that only included studies with an active control condition, there was no evidence of a beneficial effect of treatment on children's pain symptoms, and heterogeneity was lower (SMD −0.13, 95% CI −0.33 to 0.06; participants = 1018; studies = 8; I^2 = 55%). We found that there was not a beneficial effect of psychological therapies on children's pain symptoms at follow-up (SMD −0.12, 95% CI −0.32 to 0.09; participants = 966; studies = 8; I^2 = 58%; Analysis 6.5). At post-treatment, we judged the quality of this evidence as low, downgraded twice due to heterogeneity. At follow-up, we judged the quality of the evidence as low, downgraded once for heterogeneity and once for imprecision (wide confidence intervals).
- No studies of children with chronic pain conditions presented data on family functioning post-treatment or follow-up.

Diabetes

Fifteen studies (1488 participants) evaluated the effect of psychological therapies for parents of children with diabetes (Ambrosino 2008; Doherty 2013; Ellis 2005; Ellis 2012; Ellis 2017a; Ellis 2017b; Husted 2014; Laffel 2003; May 2017; Mayer-Davis 2015; Nansel 2009; Nansel 2012; Westrupp 2015; Wysocki 1999; Wysocki 2006). All studies used an active control comparator condition, and therefore we did not conduct our planned subgroup analyses to investigate heterogeneity. There were six studies with high risk of selected reporting bias for child symptoms post-treatment (Ambrosino 2008; Ellis 2017a; Nansel 2012; Westrupp 2015; Wysocki 1999; Wysocki 2006); see 'Sensitivity analyses' below for results from subgroup analyses evaluating the effect of these studies on our findings for that analysis.

- We found that psychological treatments had a large beneficial effect on parenting behavior post-treatment (SMD −1.39, 95% CI −2.41 to −0.38; participants = 338; studies = 5; I^2 = 94%; Analysis 7.1). Heterogeneity was high, indicating that there may have been considerable inconsistency in the results among these studies. Only two studies reported parenting behavior at follow-up (110 participants; Husted 2014; Westrupp 2015); we did not interpret these results due to the small number of studies in the analysis. We judged this evidence as very low at both time points. At post-treatment and follow-up, we downgraded the quality of evidence once for limitation of study design/implementation and twice for heterogeneity.
- We did not find evidence of a beneficial effect of psychological therapies for parents of children with diabetes on parent mental health post-treatment (SMD −0.24, 95% CI −0.90 to 0.42; participants = 211; studies = 3; I^2 = 82%; Analysis 7.2). Heterogeneity was high, indicating that there may have been considerable inconsistency in the results among these studies. Only two studies reported parent mental health at follow-up (participants = 130; Ambrosino 2008; Westrupp 2015), therefore we did not interpret these results. We judged the quality of this evidence as very low at both time points. At post-treatment, we downgraded the quality of evidence twice for heterogeneity and once for imprecision. At follow-up, we downgraded the quality of evidence once for limitation of study design/implementation and twice for imprecision.
- No studies of children with diabetes presented data on child behavior/disability at post-treatment or follow-up.
- For child mental health, we did not find evidence of a beneficial treatment effect post-treatment (SMD −0.09, 95% CI −0.40 to 0.21; participants = 467; studies = 6; I^2 = 63%; Analysis 7.3). Heterogeneity was high, indicating there may have been inconsistency in the results among these studies. Only two studies presented data on child mental health at follow-up (participants = 110; Husted 2014; Westrupp 2015), and we did not interpret these results due to the small number of studies in the analysis. We judged the quality of this evidence as very low; we downgraded once for limitations of study design/implementation and twice for imprecision (wide confidence intervals and small number of participants).
- We did not find evidence of a beneficial effect of psychological therapies on diabetes-related medical symptoms post-treatment (SMD −0.02, 95% CI −0.25 to 0.21; participants = 1339; studies = 13; I^2 = 75%; Analysis 7.4), or at follow-up (SMD −0.04, 95% CI −0.35 to 0.27; participants = 518; studies = 6; I^2 = 67%; Analysis 8.4). Heterogeniety was high indicating that there may be inconsistency in the results of these studies. We judged the quality of this evidence post-treatment to be low, and we further downgraded this rating at follow-up to very low. At post-treatment, we downgraded our quality of evidence rating once due to limitations of study design/implementation, and once for imprecision (wide confidence intervals). At follow-up, we also downgraded our quality of evidence rating once for high probability of publication bias.
- In our analysis of family functioning, we did not find evidence of a beneficial treatment effect at post-treatment (SMD −0.15, 95% CI −0.31 to 0.01; participants = 701; studies = 9; I^2 = 9%; Analysis 7.5). Only two studies were available to analyze at follow-up (participants = 158; Ambrosino 2008; Westrupp 2015), therefore we did not interpret these results. At post-treatment, we judged the quality of evidence for family functioning as moderate; we downgraded our quality of evidence rating once due to limitations in study design/implementation. At follow-up, we judged the quality of evidence as very low; we downgraded once due to limitations in study design/implementation and twice for imprecision.

Skin diseases

We found one study that evaluated the effect of psychological therapies for parents of children with skin diseases, which used active control comparator conditions (participants = 77; Morawska 2016). In this study, the authors reported on parenting behavior, child mental health, child symptoms, and family functioning at post-treatment and follow-up. Since we only identified one study, we were not able to draw conclusions on the effects of treatment. We judged the quality of this evidence to be very low; we downgraded twice for imprecision (small number of participants), and once for high probability of publication bias.

Traumatic brain injury (TBI)

We found three studies of psychological therapies for parents of children with TBI, which were conducted by the same author group (participants = 262; Wade 2006a; Wade 2014; Wade 2017). All three studies used an active control comparator condition. We did not conduct planned subgroup analyses due to the small number of studies.

- We identified a large beneficial effect of treatment on parenting behavior post-treatment (SMD −0.74, 95% CI −1.25 to −0.22; participants = 254; studies = 3; I^2 = 71%; Analysis 11.1), although heterogeneity was high indicating that there may be inconsistency in the results between these studies. Only one study reported on parenting behavior at follow-up and so we are not able to comment on whether this treatment effect is maintained over time (participants = 113; Wade 2014). We judged the quality of this evidence to be very low, downgraded twice due to heterogeneity and once due to imprecision (small number of participants).
- We were unable to draw conclusions about the effect of psychological therapies on parent mental health because only two studies presented data on this outcome at post-treatment (participants = 165; Wade 2006a; Wade 2014) and only one study presented data at follow-up (participants = 113; Wade 2014). We judged the quality of this evidence to be low post-treatment, downgraded twice due to imprecision (very low number of participants) and very low at follow-up, downgraded twice due to imprecision (very low number of participants) and once for high probability of publication bias.
- We were unable to draw conclusions about the effect of treatment on child behavior/disability because only one study presented data on this outcome at post-treatment and follow-up (participants = 121; Wade 2014). We judged the quality of this evidence to be very low at post-treatment and follow-up, downgraded twice due to imprecision (very low number of participants) and once due to high probability of publication bias.
- We found a moderate beneficial effect of psychological therapies on child mental health at post-treatment (SMD −0.43, 95% CI −0.69 to −0.18; participants = 251; studies = 3; I^2 = 0%; Analysis 11.4). Only one study reported data on child mental health at follow-up and so we are not able to draw conclusions

about whether this treatment effect is maintained over time (participants = 98; Wade 2014). We judged the quality of this evidence to be moderate at post-treatment (downgraded once due to imprecision (small number of participants)) and very low at follow-up, downgraded twice due to imprecision (very low number of participants) and once due to high probability of publication bias.

- No studies reported on child medical symptoms post-treatment or follow-up.
- Only one study reported on family functioning at post-treatment and follow-up and so we are not able to draw conclusions (participants = 121; Wade 2014). We judged the quality of this evidence to be very low at post-treatment and follow-up, downgraded twice due to imprecision (small number of participants) and once for high probability of publication bias.

Individual psychological therapies across all conditions

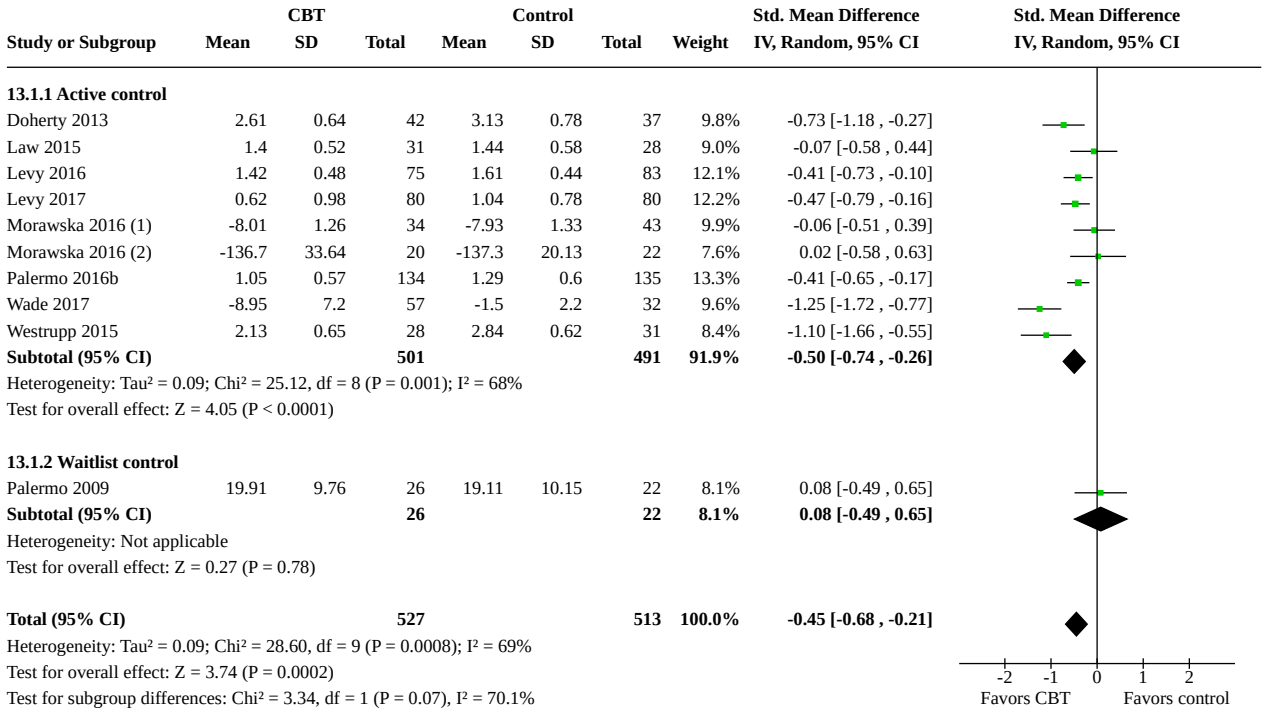
Cognitive-behavioral therapy (CBT)

We found 21 studies of CBT for parents of children with chronic medical conditions (2070 participants) (Ambrosino 2008; Bonnert 2017; Doherty 2013; Hoekstra-Weebers 1998; Kashikar-Zuck 2012; Laffel 2003; Law 2015; Levy 2010; Levy 2016; Levy 2017; Morawska 2016; Palermo 2009; Palermo 2016b; Powers 2013; Robins 2005; Sanders 1994; Stark 2005; Stehl 2009; Tsitsi 2017; Wade 2017; Westrupp 2015).Two of these studies used wait-list control comparator conditions (Bonnert 2017; Palermo 2009), and the remaining 19 studies used active control conditions. When there were 10 or more studies included in the primary analysis, we conducted our planned subgroup analyses to investigate heterogeneity by evaluating only studies that used an active control comparator condition. We were not able to conduct our planned subgroup analyses using only studies with a wait-list control condition due to the small number of available studies. We rated eight studies as having high risk of selective reporting bias on the outcomes of parent behavior, parent mental health, child behavior, child mental health, and child symptoms post-treatment, and child symptoms at follow-up (Ambrosino 2008; Levy 2010; Levy 2016; Levy 2017; Morawska 2016; Powers 2013; Sanders 1994; Westrupp 2015); see the 'Sensitivity analyses' section below for subgroup analyses evaluating the effect of these studies on our findings for these outcomes.

- We entered 10 studies post-treatment and six studies at follow-up into an analysis to investigate the effects of CBT across all chronic medical conditions on parenting behavior. We found a moderate beneficial effect of CBT on parenting behavior post-treatment (SMD −0.45, 95% CI −0.68 to −0.21; participants = 1040; studies = 10; I^2 = 69%; Analysis 13.1; Figure 4), which was maintained at follow-up (SMD −0.26, 95% CI −0.42 to −0.11; participants = 743; studies = 6; I^2 = 9%; Analysis 14.1). We judged the quality of the evidence for CBT on parenting behavior to be low post-treatment, downgraded once for heterogeneity, and once for publication bias, and moderate at follow-up, downgraded once for publication bias (Summary of findings 1; Summary of findings 2). At post-treatment, we were able to examine heterogeneity and found the same pattern of results when the subgroup analysis included only studies with an active control condition (SMD −0.50, 95% CI −0.74 to −0.26; participants = 992; studies = 9; I^2 = 68%).
- Eight studies at post-treatment and five studies at follow-up presented data on parent mental health. We did not find evidence for a beneficial effect of CBT on parent mental health post-treatment (SMD −0.19, 95% CI −0.41 to 0.03; participants = 811; studies = 8; I^2 = 53%; Analysis 13.2; Figure 5), or follow-up (SMD −0.07, 95% CI −0.34 to 0.20; participants = 592; studies = 5; I^2 = 55%; Analysis 14.2). All of the studies used active control conditions and so we were not able to conduct our planned subgroup analysis to evaluate heterogeneity. We judged the quality of evidence for CBT on parent mental health as very low at post-treatment and follow-up. We downgraded both time points once for heterogeneity, once for imprecision (wide confidence intervals), and once for high probability of publication bias.
- CBT had a small beneficial effect on child behavior/disability post-treatment (SMD −0.22, 95% CI −0.35 to −0.08; participants = 1236; studies = 10; I^2 = 25%; Analysis 13.3), which was maintained at follow-up (SMD −0.28, 95% CI −0.40 to −0.15; participants = 1038; studies = 8; I^2 = 0%; Analysis 14.3). We judged the quality of evidence as moderate post-treatment and at follow-up, and downgraded once for probability of publication bias. When we conducted our planned subgroup analysis at post-treatment we found that there was still a beneficial effect of treatment and heterogeneity was lower (SMD −0.18, 95% CI −0.31 to −0.05; participants = 1093; studies = 8; I^2 = 13%).
- We did not find evidence of a beneficial effect of CBT on child mental health post-treatment (SMD −0.08, 95% CI −0.19 to 0.03; participants = 1786; studies = 15; I^2 = 21%; Analysis 13.4), or at follow-up (SMD −0.07, 95% CI −0.19 to 0.04; participants = 1244; studies = 10; I^2 = 0%; Analysis 14.4). We judged this evidence to be high quality at post-treatment, and moderate at follow-up, downgraded once for probability of publication bias. To investigate heterogeneity in the post-treatment analysis, we conducted our planned subgroup analysis and found that there was still no evidence of a beneficial treatment effect and heterogeneity was slightly higher (SMD −0.09, 95% CI −0.21 to 0.02; participants = 1637; studies = 13; I^2 = 26%).
- For child medical symptoms, we found a beneficial effect of CBT post-treatment (SMD −0.38, 95% CI −0.71 to −0.06; participants = 1434; studies = 13; I^2 = 89%, Analysis 13.5), although this was not maintained at follow-up (SMD −0.13, 95% CI −0.32 to 0.06; participants = 1136; studies = 10; I^2 = 60%; Analysis 14.5). We judged this as very low-quality evidence post-treatment and low-quality at follow-up. We downgraded post-treatment time points twice for heterogeneity and once for imprecision (wide confidence intervals). At follow-up, we downgraded once for heterogeneity and once for publication bias. We investigated heterogeneity post-treatment with our planned subgroup analysis, and results indicated that there was no longer evidence of a beneficial treatment effect when only studies with an active control condition were included in the analysis, and heterogeneity was lower (SMD −0.15, 95% CI −0.32 to 0.02; participants = 1291; studies = 11; I^2 = 55%).
- We also examined the effect of CBT on family functioning, and we did not find evidence of a beneficial treatment effect post-treatment (SMD −0.11, 95% CI −0.35 to 0.13; participants = 429; studies = 5; I^2 = 37%; Analysis 13.6), or at follow-up (SMD −0.04, 95% CI −0.32 to 0.24; participants = 201; studies = 3; I^2 = 0%; Analysis 14.6). We judged this evidence to be very low quality at both time points. We downgraded post-treatment once for

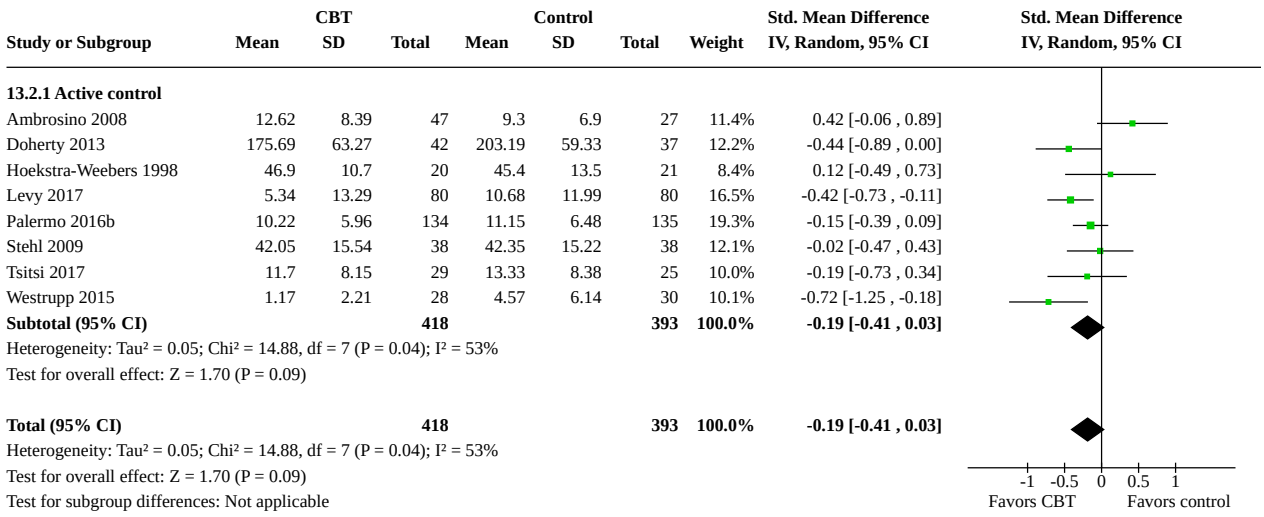
imprecision and twice for high probability of publication bias, and follow-up twice for limitations in study design and once for publication bias.

Figure 4. Forest plot of comparison 13, cognitive-behavioural therapy post-treatment, outcome 13.1: parenting behavior



Footnotes
(1) Eczema sample
(2) Asthma sample

Figure 5. Forest plot of comparison 13, cognitive-behavioural therapy post-treatment, outcome 13.2: parent mental health



Family therapy (FT)

Four studies evaluated FT for parents of children with chronic medical conditions (participants = 389; Kazak 2004; Wysocki 1999; Wysocki 2006; Yeh 2016). Only one study used a wait-list control condition (Kazak 2004), and the remaining three studies used active control conditions. We were not able to conduct our planned subgroup analyses to investigate heterogeneity due to the small number of available studies.

- We did not conduct analyses of the effect of FT on parenting behavior post-treatment and follow-up because no studies presented extractable data. Only one study of FT presented data on parent-mental health post-treatment and follow-up (participants = 65; Yeh 2016), therefore we could not draw any conclusions.
- No studies presented data on the effect of FT on child behavior/disability post-treatment or follow-up and so we did not conduct analyses.
- Only one study reported the effect of treatment on child mental health and so we were not able to draw conclusions (participants = 74; Wysocki 1999).
- We entered three studies into an analysis of the effects of FT on child symptoms post-treatment and we did not find evidence of a beneficial treatment effect (SMD −0.18, 95% CI −0.77 to 0.40; participants = 197; studies = 3; I^2 = 77%; Analysis 15.3). Because only one study presented extractable data on child symptoms at follow-up (participants = 65; Yeh 2016), we did not interpret the results.
- We entered three studies into an analysis of the effects of FT on family functioning post-treatment and we did not find evidence of a beneficial treatment effect (SMD −0.34, 95% CI −0.89 to 0.21; participants = 197; studies = 3; I^2 = 73%; Analysis 15.4). Only one study reported family functioning at follow-up (participants = 65; Yeh 2016), therefore we were unable to draw any conclusions.

We judged the quality of evidence for family therapy to be very low. Where we were able to conduct meta-analyses, we downgraded evidence twice for heterogeneity and once for imprecision. We judged the studies eligible for inclusion in the remaining analyses to have limitations in study design/implementation, high probability of publication bias, and imprecision due to small sample sizes. Heterogeneity was high for these analyses, indicating that there may have been considerable inconsistency in the results among studies of FT.

Motivational interviewing (MI)

Three studies evaluated MI for parents of children with chronic medical conditions, and all three used active control comparator conditions (participants = 193; Ellis 2017a; May 2017; Mayer-Davis 2015).

- Two studies evaluated parent MI and reported data on parenting behavior post-treatment (participants = 143; Ellis 2017a; May 2017). We did not interpret the results due to the small number of studies in the analysis. No studies presented data on parenting behavior at follow-up, or on parent mental health post-treatment or follow-up.
- No studies of MI presented data on child behavior/disability or child mental health post-treatment or follow-up. Only two studies reported data on the effect of MI on child medical symptoms post-treatment (participants = 122; Ellis 2017a; Mayer-Davis 2015), therefore we did not interpret the results. No studies presented data on child medical symptoms at follow-up.
- For family functioning, only two studies presented extractable data and we did not interpret the results due to the small number of studies in the analysis (participants = 143; Ellis 2017a; May 2017). We did not conduct an analysis evaluating the effect of MI on family functioning at follow-up due to lack of data.

Although we were unable to conduct any meta-analyses for outcomes related to MI, we judged the quality of the evidence for MI as very low. We downgraded evidence once for limitation of study design/implementation and twice for imprecision.

Multisystemic therapy (MST)

There were four studies (participants = 427) that evaluated MST for parents of children with chronic medical conditions, which were conducted by the same author group (Ellis 2005; Ellis 2012; Ellis 2017b; Naar-King 2014). All four studies used an active control comparator condition.

- Only one study of MST presented extractable data on parenting behavior post-treatment, therefore we were unable to draw any conclusions (participants = 167; Naar-King 2014). No studies reported on parenting behavior at follow-up. No studies presented extractable data on parent mental health post-treatment or follow-up.
- No studies reported on child behavior/disability at post-treatment or follow-up. Only one study presented data on child mental health post-treatment (participants = 117; Ellis 2005), and none at follow-up, therefore we could not draw any conclusions.
- We entered four studies into an analysis evaluating child symptoms post-treatment, and we did not find evidence of a beneficial treatment effect (SMD −0.18, 95% CI −0.45 to 0.08; participants = 477; studies = 4; I^2 = 50%; Analysis 18.3. We rated this outcome as very low quality, downgraded twice for imprecision (small number of participants and wide confidence intervals) and once for heterogeneity. Only two studies reported on child symptoms at follow-up (participants = 247; Ellis 2005; Ellis 2012). We did not interpret these results due to the small number of studies in the analysis.
- None of the studies reported family functioning post-treatment or at follow-up.

We judged the quality of evidence for the remaining MST outcomes as very low; we downgraded all outcomes once for imprecision, and twice for high probability of publication bias.

Problem-solving therapy (PST)

There were 12 studies (participants = 1763), which evaluated PST for parents of children with chronic illness (Daniel 2015; Greenley 2015; Husted 2014; Nansel 2009; Nansel 2012; Palermo 2016a; Sahler 2002; Sahler 2005; Sahler 2013; Seid 2010; Wade 2006a; Wade 2014). Of these, three studies used wait-list control comparator conditions (Daniel 2015; Greenley 2015; Seid 2010), and the remaining used active control conditions. We were not able to conduct our planned subgroup analyses to investigate heterogeneity because there were too few studies included in the primary analyses.

- PST had a small to moderate beneficial effect on parenting behavior post-treatment (SMD −0.39, 95% CI −0.64 to −0.13; participants = 947; studies = 7; I^2 = 67% ; Analysis 20.1; Figure 6), which was maintained at follow-up (SMD −0.54, 95% CI −0.94 to −0.14; participants = 852; studies = 6; I^2 = 86%; Analysis 21.1). We judged the quality of evidence for PST on parenting behavior post-treatment as low, and very low at follow-up (Summary of findings 3; Summary of findings 4). We downgraded the post-treatment and follow-up time points twice for heterogeneity and once more at follow-up for imprecision (wide confidence intervals).
- PST also had a small beneficial effect on parent mental health post-treatment (SMD −0.30, 95% CI −0.45 to −0.15; participants = 891; studies = 6; I^2 = 14%; Analysis 20.2; Figure 7), and at follow-up (SMD −0.21, 95% CI −0.35 to −0.07; participants = 800; studies = 5; I^2 = 0%; Analysis 21.2). We judged the quality of evidence for PST on parent mental health post-treatment and at follow-up as moderate; we downgraded once each for high probability of publication bias.
- We did not find evidence of a beneficial effect of PST on child behavior/disability post-treatment (SMD 0.08, 95% CI −0.18 to 0.33; participants = 247; studies = 3; I^2 = 0%; Analysis 20.3). We did not interpret the results at follow-up because only two studies were included in the analysis (participants = 166; Palermo 2016a; Wade 2014). We rated the quality of evidence post-treatment for PST on child behavior/disability as very low. At post-treatment, we downgraded once for imprecision (small number of participants) and twice for high probability of publication bias. At follow-up, we judged the quality of evidence to be very low; we downgraded twice for imprecision and once for high probability of publication bias.
- We did not find evidence of a beneficial effect of PST on child mental health post-treatment (SMD −0.12, 95% CI −0.50 to 0.25; participants = 276; studies = 4; I^2 = 56%; Analysis 20.4), or at follow-up (SMD 0.59, 95% CI −0.28 to 1.46; participants = 212; studies = 3; I^2 = 89%; Analysis 21.4). At post-treatment and follow-up, we judged the quality of evidence for PST on child mental health as very low. We downgraded the quality of evidence post-treatment once for heterogeneity and twice for imprecision. We downgraded the quality of evidence at follow-up once for imprecision, and twice for high probability of publication bias.
- We did not find evidence of a beneficial effect of PST on child symptoms post-treatment (SMD 0.25, 95% CI −0.23 to 0.72; participants = 679; studies = 5; I^2 = 87%; Analysis 20.5) or follow-up (SMD 0.25, 95% CI −0.08 to 0.59; participants = 210; studies = 3; I^2 = 30%; Analysis 21.5). We rated the post-treatment outcome as very low-quality evidence; we downgraded once for high probability of publication bias and twice for heterogeneity at post-treatment. At follow-up, we downgraded twice for high probability of publication bias and once for imprecision.
- Only two studies presented extractable data on family functioning post-treatment (participants = 237; Nansel 2009; Wade 2014), and so we did not interpret these results. Only one study of PST presented data on family functioning at follow-up (participants = 101; Wade 2014), therefore we conducted no analysis. We judged the quality of this evidence to be very low; we downgraded twice for imprecision and once for high probability of publication bias.

Figure 6. Forest plot of comparison 20, problem-solving therapy post-treatment, outcome 20.1: parenting behavior

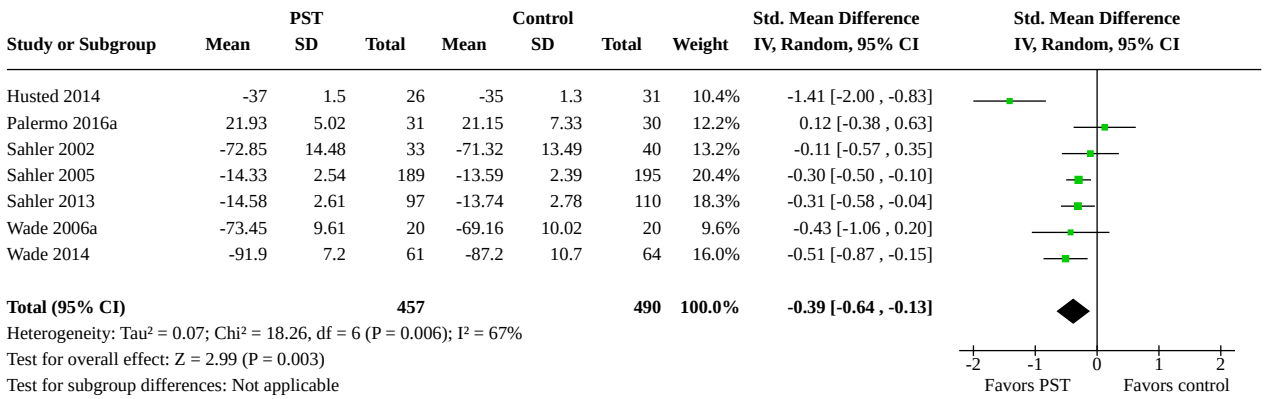
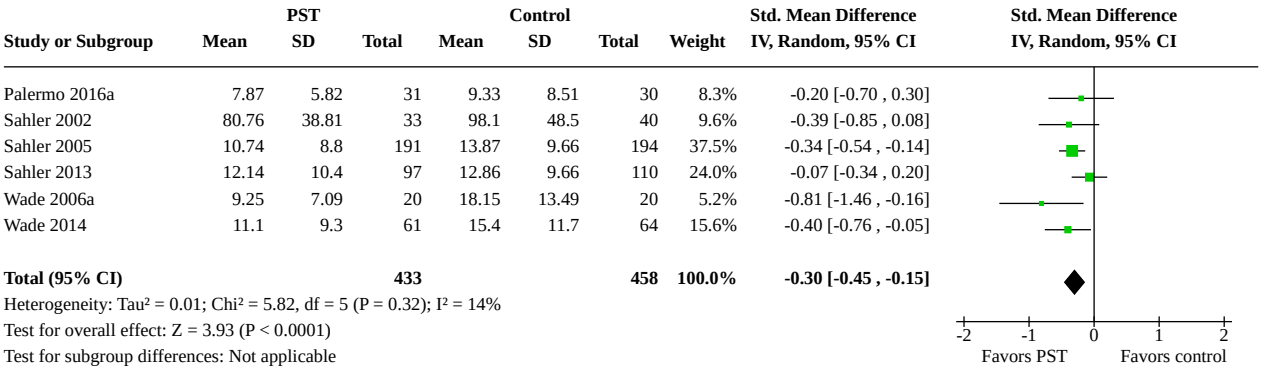


Figure 7. Forest plot of comparison 20, problem-solving therapy post-treatment, outcome 20.2: parent mental health



Adverse events

We found 12 studies that reported on whether or not adverse events occurred during the study period. In six of these studies, the authors reported that there were no adverse events during the study period (Doherty 2013; Ellis 2017b; Law 2015; Levy 2017; Morawska 2016; Nansel 2009). In the remaining six studies, the authors reported that adverse events occurred during the study period although none were attributed to psychological therapies (Ellis 2012; Kashikar-Zuck 2012; Nansel 2009; Powers 2013; Palermo 2016a; Palermo 2016b). In one study (Powers 2013, participants = 129), children reported expected side effects of the study medication amitriptyline (e.g. fatigue, drowsiness, dizziness) as well as respiratory symptoms (e.g. influenza, seasonal allergies), which were reported more frequently by the control group (education + amitriptyline) than the treatment group (CBT + amitriptyline). In two studies, participants reported major life events and stressors during the study period (e.g. parent death, serious illness) as well as self-harm behaviors; the study authors note that these events were not attributed to participation in study procedures (Palermo 2016a, participants = 60; Palermo 2016b, participants = 258). In another study, the most commonly reported adverse event was infection (e.g. sinus infection, strep throat) and there was one participant who had a psychiatric hospitalization for further assessment of symptoms revealed at the first treatment session (Kashikar-Zuck 2012, participants = 100); the authors reported that these events were not study-related and did not differ between treatment groups. In two studies, the authors reported that rates of diabetes-related events (e.g. hypoglycemia) were the same for the treatment and control groups and these were not attributed to the study procedures (Ellis 2012; participants = 117; Nansel 2009; participants = 116).

Authors of the remaining 32 studies did not report on whether or not adverse events occurred. Kazak 2004 did not report any adverse events, but reported that participants with higher distress were more likely to drop out of the treatment compared to less distressed participants.

We judged the quality of evidence for adverse events as moderate; we downgraded once for publication bias.

Sensitivity analyses

We examined the impact of studies with high risk of selective reporting bias by removing the 18 studies where the authors provided missing data on request but did not report these data in the published manuscripts. To minimize the total number of analyses conducted for this review, we conducted sensitivity analyses only when the primary analysis included more than 10 studies.

Chronic pain

There were four studies with high risk of selective reporting bias that we included in analyses of the effect of treatment on child behavior, child mental health, and child symptoms post-treatment (Levy 2010; Levy 2016; Levy 2017; Powers 2013).

- For child behavior, when we removed studies with high risk of bias, there was no longer evidence for a beneficial effect of the intervention (SMD −0.10, 95% CI −0.30 to 0.10; participants = 751; studies = 8). This is inconsistent with the primary analysis, which found a beneficial effect of treatment when all studies were included regardless of the risk of reporting bias.
- For child mental health, when we removed studies with high risk of bias, there was no evidence for a beneficial effect of the intervention, which is consistent with the primary analysis (SMD −0.01, 95% CI −0.16 to 0.14; participants = 685; studies = 7).
- For child symptoms, when we removed studies with high risk of bias, there was no evidence for a beneficial effect of treatment, which is consistent with the primary analysis (SMD −0.09, 95% CI −0.31 to 0.13; participants = 565; studies = 7).

Diabetes

There were six studies with high risk of selected reporting bias for child symptoms post-treatment (Ambrosino 2008; Ellis 2017a; Nansel 2012; Westrupp 2015; Wysocki 1999; Wysocki 2006).

- When we removed studies with high risk of bias, there was no evidence of a beneficial effect of treatment on child symptoms (SMD 0.06, 95% CI −0.35 to 0.48; participants = 641; studies = 7), which is consistent with the primary analysis.

Cognitive-behavioral therapy

Among studies of CBT, we rated eight studies as having high risk of selective reporting bias on the outcomes of parent behavior,

parent mental health, child behavior, child mental health, and child symptoms post-treatment, and child symptoms at follow-up (Ambrosino 2008; Levy 2010; Levy 2016; Levy 2017; Morawska 2016; Powers 2013; Wade 2017; Westrupp 2015).

- For parent behavior post-treatment, there was still evidence of a beneficial effect of treatment (SMD −0.33, 95% CI −0.63 to −0.02; participants = 455; studies = 4), which is consistent with the primary analysis.
- For parent mental health post-treatment, there was still no evidence of a beneficial effect of the intervention (SMD −0.16, 95% CI −0.33 to 0.02; participants = 519; studies = 5), which is consistent with the primary analysis.
- For child behavior post-treatment, there was still a beneficial effect of the intervention (SMD −0.24, 95% CI −0.46 to −0.02; participants = 625; studies = 6), which is consistent with the primary analysis.
- For child mental health, there was still no evidence of a beneficial effect of the intervention (SMD −0.11, 95% CI −0.30 to 0.08; participants = 705; studies = 7), which is consistent with the primary analysis.
- For child symptoms post-treatment, when we removed studies with high risk of bias, there was no longer evidence of a beneficial effect of treatment (SMD −0.61 95% CI −1.27 to 0.05, participants =703, studies = 6). This is not consistent with the primary analysis, which found a beneficial effect of treatment on child symptoms when all studies were included regardless of the risk of reporting bias.
- For child symptoms at follow-up, there was still no evidence of a beneficial treatment effect (SMD −0.20, 95% CI −0.60 to 0.21; participants = 477; studies = 4), which is consistent with the primary analysis.

DISCUSSION

This is the second updated version of the original Cochrane Review published in 2012 (Eccleston 2012b), and first updated in 2015 (Eccleston 2015).

Summary of main results

There were two objectives of this review:

- First, we aimed to evaluate the efficacy of psychological therapies for parents of children with a chronic medical condition including asthma, chronic pain conditions, cancer, diabetes mellitus, gynecologic disorders, IBD, skin diseases, and TBI. We also aimed to evaluate adverse events caused by psychological therapies in these populations.
- Second, we sought to evaluate the risk of bias and quality of evidence for the included studies.

We included 44 studies in this updated review. Children in these studies had asthma, cancer, chronic pain, diabetes mellitus, IBD, skin diseases, and TBI. We did not identify any studies of children with gynecologic disorders. For analyses, we combined the two studies of children with IBD with studies of children with chronic pain. Types of psychotherapy interventions were: cognitive-behavioral therapy (CBT), family therapy (FT), motivational interviewing (MI), multisystemic therapy (MST), and problem-solving therapy (PST). Our primary outcomes were parenting behavior and parent mental health. Our secondary outcomes were child behavior/disability, child mental health, child medical symptoms, family functioning, and adverse events. We conducted two sets of analyses to address the following questions:

- For each medical condition, across all types of psychotherapy, what is the efficacy for each outcome post-treatment and at follow-up?
- For each type of psychological therapy, across all medical conditions, what is the efficacy for each outcome post-treatment and at follow-up?

It should be noted that beneficial treatment effects emerged when there was homogeneity of approach, homogeneity of outcome measurements, and a larger number of participants. In addition, we are not able to make conclusions about whether these beneficial treatment effects could be clinically meaningful.

Combined psychological therapies for each illness condition

We evaluated the efficacy of all psychological therapies delivered to parents for each medical condition (Table 3). Overall, we found that the pattern of effects for psychological therapies varied by medical condition. Where we did identify evidence for a beneficial effect of treatment, the effect sizes were generally small, indicating that the benefits of treatment may be small. Importantly, the quality of evidence for most of these outcomes was low to very low, with the exception of chronic pain conditions, which we rated from low to high quality, and so these findings should be interpreted cautiously.

Among studies of children with cancer, we found that psychological therapies had beneficial effects on parenting behavior and parent mental health post-treatment and follow-up. We were not able to determine the effect of psychological therapies on child outcomes or family functioning for children with cancer because very few studies evaluated these outcomes.

We identified predominantly beneficial effects for psychological therapies delivered to parents of children with chronic pain. In this group, psychological therapies had a beneficial and long-lasting effect on parenting behavior and parent mental health. We also found beneficial effects on child behavior/disability at post-treatment and follow-up, and child medical symptoms at post-treatment, although this was not maintained at follow-up. There was no evidence of a beneficial effect on children's mental health symptoms assessed post-treatment or follow-up. Family functioning was not assessed in any of the studies of children with chronic pain.

Among studies of children with traumatic brain injury, we found that psychological therapies had beneficial effects on parenting behavior and child mental health post-treatment. We were not able to evaluate the long-term maintenance of these treatment effects because very few studies reported on these outcomes at follow-up. We were unable to draw conclusions about the effect of treatment on parent mental health, child behavior/disability, and family functioning because very few studies reported on these outcomes post-treatment or follow-up. Child medical symptoms were not assessed in any of the studies of children with traumatic brain injury.

Among studies of children with diabetes, a different and somewhat less favorable pattern of results emerged. We found that psychological therapies had a beneficial effect on parenting

behavior post-treatment; it was not possible to assess long-term maintenance because very few of the studies reported on parenting behavior at follow-up. We did not find evidence of a beneficial effect of treatment on parent mental health, child mental health, child medical symptoms, or family functioning post-treatment. For child medical symptoms, we found no evidence of a beneficial effect at follow-up. Too few studies reported on the remaining outcomes at follow-up to understand the potential long-term effects of treatment. None of the studies assessed child behavior/disability and so it was not possible to determine the effect of treatment on this outcome.

We were also able to evaluate the effect of psychological therapies on medical symptoms for children with asthma. Similar to the meta-analysis on medical symptoms for children with diabetes, we did not find evidence for a beneficial effect of psychological therapies on children's asthma symptoms post-treatment although there were too few studies to evaluate the effect of treatment at follow-up. We were not able to determine the effect of psychological therapies on other outcomes for children with asthma due to insufficient data.

Analyses for skin diseases were either not interpreted due to very limited data or not conducted due to lack of data.

Individual psychological therapies for combined illness conditions

We evaluated the efficacy of each type of psychotherapy across all medical conditions combined (Table 4). Overall, we identified varying patterns of findings by therapy type. These findings should be interpreted with caution as the quality of evidence was predominantly low to very low, indicating that these results could change as more studies are conducted.

Parent outcomes

The majority of included studies evaluated either CBT or PST, and both psychotherapy types resulted in similar benefits for parenting behavior post-treatment and follow-up. PST was also beneficial for improving parent mental health post-treatment and follow-up. These effect sizes were generally small indicating modest improvements may be expected from treatment. We found no evidence of a beneficial effect for CBT on parent mental health post-treatment or follow-up. We were not able to determine the effect of FT, MI, and MST on parent outcomes due to insufficient data.

Child and family outcomes

The pattern of results for child and family outcomes was more variable. For CBT, we found beneficial effects on child behavior/disability post-treatment and follow-up. We also found a small beneficial effect for CBT on child medical symptoms post-treatment, although this was not maintained at follow-up. There was no evidence of a beneficial effect of CBT on child mental health or family functioning post-treatment or at follow-up. Where beneficial treatment effects were detected, effect sizes were generally small, indicating that modest improvements in child behavior/disability and child medical symptoms may be expected from CBT.

In contrast, there was no evidence for a beneficial effect of PST on any of the three child outcomes post-treatment and we found this was maintained at follow-up for child mental health. There were insufficient data to evaluate the effect of PST on child behavior/disability and medical symptoms at follow-up and on family functioning at either time point.

We were not able to determine the effect of FT and MST on most of the child and family outcomes in this review due to insufficient data. There was no evidence of a beneficial effect of FT or MST on child medical symptoms post-treatment; there were insufficient data to evaluate whether this pattern was maintained at follow-up. For FT, there was no evidence of a beneficial effect of treatment on family functioning post-treatment and too few studies reported family functioning at follow-up. Remaining analyses were not conducted or not interpreted due to insufficient data.

For MI, there were insufficient data to determine the effect of treatment on any of the outcomes extracted for this review.

Adverse events

The majority of studies (n = 32) did not report whether adverse events due to treatment occurred during the study period. Among those studies that did report adverse events, none found any adverse events due to psychological therapy. Because relatively few studies reported whether or not they encountered adverse events, we are unable to comment on the relevance of adverse events to treatment safety, which is a limitation of this review.

Planned subgroup analyses to evaluate heterogeneity

In this update, for primary analyses that included more than 10 studies, we conducted planned subgroup analyses to evaluate heterogeneity due to the inclusion of active versus wait-list comparator control conditions. Findings from subgroup analyses indicated that variability between studies may have been due to different types of control comparator conditions (i.e. active versus wait-list), When we included studies with only active control conditions in subgroup analyses, heterogeneity was often lower. It is difficult to interpret differences on treatment efficacy identified in the primary analyses versus the subgroup analyses due to the relatively small number of studies included in the subgroup analyses. This issue should be considered in the next update of this review.

Sensitivity analyses

We also conducted sensitivity analyses to evaluate the effect of studies with high risk of reporting bias for analyses that included more than 10 studies. For these analyses, we excluded studies where the outcome data were not fully reported in the published manuscript but were provided to us by the authors on request. Results of our sensitivity analyses indicate that we would have identified a different pattern of findings if we had not contacted authors for these missing data. Non-production of data in science is a significant problem (Nature 2009), and our results support prior work indicating that this is a particular concern in psychology research (Wicherts 2006; Wicherts 2011).

Overall completeness and applicability of evidence

We were unable to identify any studies for children with gynecologic disorders, therefore studies investigating these disorders are still needed. However, for the first time in the history of this review, this update includes several expanded populations including studies of children with IBD (which we included in the chronic pain conditions analysis, Greenley 2015; Levy 2016), and

studies of MI (Ellis 2017a; Mayer-Davis 2015; May 2017). In our last review we noted that studies of PST were predominantly comprised of parents of children with cancer. PST has now been tested in additional populations including parents of children with chronic pain (Palermo 2016a), and IBD (Greenley 2015).

Many analyses were not interpreted or conducted due to insufficient data. Typically, this occurred because most studies assessed some but not all of the outcome domains extracted for this review. Given our growing understanding of bi-directional relationships between parent, child, and family functioning across a variety of pediatric populations (e.g. Morawska 2015; Palermo 2014), we recommend that parent, child, and family outcomes should be routinely assessed in future studies of psychological interventions for parents of children with chronic illness.

Quality of the evidence

In general, we judged 'Risk of bias' ratings as low or unclear with the exception of selective reporting bias, which we judged to be high risk for nearly half of the studies due to incomplete reporting of treatment outcome data in the published manuscripts. Although most study authors provided us with these data on request, there is room for improvement in clinical trial reporting practices in this domain. Our evaluation of risk of bias excluded the category of 'blinding participants and personnel' because it is not possible to blind personnel who are delivering psychological treatments; thus, this risk of bias remains.

We judged the quality of the evidence to be generally very low to moderate. Therefore, results from this update should be interpreted with caution as these findings are likely to change as future studies are conducted. Contributing factors to our quality of evidence ratings include high heterogeneity, imprecision, and publication bias. In contrast, we did judge some outcomes as moderate or high quality including some analyses of youth with chronic pain, youth with cancer, cognitive-behavioural therapies, and problem-solving therapies.

Potential biases in the review process

We searched four large databases as well as other sources (e.g. trials registry search, reference search, citation search). Therefore, we think it is unlikely that potentially eligible studies were not included in this update. There is also a potential for Type I error due to the large number of primary analyses conducted to evaluate the primary aims of this review, in addition to our planned subgroup analyses for heterogeneity and sensitivity. In the future, we may consider dividing this review into two publications to separately study treatment efficacy for each medical condition versus treatment efficacy for each type of psychological therapy.

Agreements and disagreements with other studies or reviews

Combined psychological therapies for each illness condition

Prior systematic reviews and meta-analyses have evaluated the efficacy of psychological interventions for youth with asthma (Pai 2014), cancer (Pai 2006), chronic pain conditions (Anie 2012; Fisher 2014; Fisher 2018; Rutten 2015), diabetes (Armour 2005; McBroom 2009), and TBI (Brown 2013). In general, our results are consistent with these prior reviews.

For children with asthma, our findings were inconsistent with a prior meta-analysis, which found evidence for improvements in children's medical symptoms in response to psychological treatment (Pai 2014). For children with cancer, a prior meta-analysis also found no evidence of a beneficial effect of psychological interventions on child behavior or child mental health, but positive treatment effects for parent mental health and parenting behavior (Pai 2006). Our results for children with chronic pain conditions are consistent with two previous meta-analyses that reported beneficial effects on children's disability and medical symptoms and no evidence of a beneficial effect on child mental health (Fisher 2014; Fisher 2018). Agreement with prior reviews for children with diabetes was consistent on the outcome of child medical symptoms (Armour 2005), but inconsistent on the outcome of family functioning (Delamater 2014; McBroom 2009). For children with skin diseases, findings from our review and a prior review were both inconclusive due to lack of data (Ersser 2014). Finally, for children with TBI, our analyses were consistent with a prior systematic review that identified improvements in parenting behavior and emotional adjustment as well as children's behavioral and emotional functioning (Brown 2013).

Disagreements between the present meta-analysis and previous reviews may be due to differences in methodology (e.g. where the prior review was a systematic review but did not include a meta-analysis), as well as differences in inclusion criteria, selection of outcome measures, and/or selection of comparator group.

Individual psychological therapies for combined illness conditions

In this update, we were able to evaluate the effect of CBT and PST on our primary outcomes of parenting behavior and parent mental health. We found beneficial effects of PST on parenting behavior and parent mental health, which is consistent with the prior version of this systematic review and others (Eccleston 2015; Law 2014). However, we also identified beneficial effects of CBT on parenting behavior, whereas prior reviews have reported no evidence for a beneficial effect of CBT on this outcome (Eccleston 2015; Law 2014). Consistent with other meta-analyses, we did not find evidence for beneficial effects of CBT on parent mental health (Eccleston 2015; Law 2014). Sample sizes for these analyses were substantially larger in this update compared to prior reviews, which may have increased our ability to detect beneficial treatment effects. For example, the analysis of the effect of CBT on parenting behavior in this update included 1040 participants whereas the same analysis in the prior version of this review included only 166 participants (Eccleston 2015). It is important to note that our confidence in these estimates is moderate, which means a different pattern of findings may emerge as additional studies are conducted.

We were also able to evaluate the effect of CBT on some child outcomes and family functioning, and identified a beneficial effect of treatment on child behavior/disability and medical symptoms (e.g. pain intensity), but found no evidence for a beneficial treatment effect on family functioning. For PST, data were available for child mental health, child behavior/disability, and medical symptoms at post-treatment and results indicated there was no evidence for a beneficial treatment effect on these child outcomes. This is generally consistent with prior reviews, which have also identified mixed treatment effects for child and family outcomes across populations of youth with chronic medical conditions (Eccleston 2015; Law 2014; Sansom-Daly 2012).

Importantly, in this update we were not able to evaluate the effect of FT, MST, and MI on most outcomes due to lack of available data. Similar limitations have been encountered in prior reviews (Eccleston 2015; Law 2014). Studies of MI were included for the first time in this update. A recent systematic review and meta-analysis of MI for pediatric health behavior change (Gayes 2014), found that MI had a small beneficial effect on a range of child health behaviors for children with a variety of conditions, including some of those evaluated in the present update (e.g. asthma, diabetes). Relevent to this update, MI was found to be most beneficial when both parents and children received treatment compared to when the intervention was delivered to children alone (Gayes 2014).

AUTHORS' CONCLUSIONS

Implications for practice

Implications for parents of children with a chronic illness

There is little evidence available to guide parents as to the most effective psychological intervention expected to improve their own mental health or behavioral functioning. We found that cognitive-behavioral therapy (CBT) and problem-solving therapy (PST) improved parenting behavior, and PST improved parental mental health. In addition, our findings suggest that CBT is beneficial for improving children's behavior/disability and their medical symptoms (e.g. pain). However, these findings should be interpreted cautiously because they may change as new studies are conducted.

Implications for clinicians

Overall, we judged the evidence as very low to moderate quality. Therefore, results from this update should be interpreted with caution as these findings are likely to change as future studies are conducted.

Findings regarding problem-solving therapy

- PST is the only therapy included in this review that was routinely delivered only to parents and that was expressly developed to reduce parent distress. We found that PST improved parenting behavior and parent mental health, although these results should be interpreted cautiously because they may change as new studies are conducted.
- We did not find evidence for a beneficial effect of PST on child mental health and too few studies were available to understand the effect of PST on other child outcomes or family functioning.
- Studies of PST were predominantly delivered to parents of children with cancer, but PST has also been evaluated in parents of children with chronic pain, IBD, and TBI.

Findings regarding cognitive-behavioral therapy

- CBT was typically delivered to both children and parents, and led to improvements in parenting behavior but not parent mental health.
- In contrast to PST, CBT led to improvements in some child outcomes (behavior/disability, medical symptoms).
- These results should also be interpreted cautiously because they may change as new studies are conducted.
- We did not find evidence for a beneficial effect of CBT on children's mental health or family functioning.

Findings regarding family therapy, motivational interviewing, and multisystemic therapy

- This update includes a very small number of studies of family therapy (FT), (motivational interviewing) MI, and multisystemic therapy (MST) which limits our ability to make conclusions about these therapy types.

Implications for policy makers and funders of the interventions

It is surprising how few studies have targeted parenting behavior or mental health, given the ample evidence demonstrating the bidirectional effects of child and parent functioning in the context of chronic illness. When combining all therapies for parenting outcomes, we concluded that the quality of evidence was mostly low to very low, meaning further research is likely to change the estimates of effects. This is primarily due to the small number of studies that reported parent outcomes, particularly for therapy types other than CBT and PST. Thus, additional clinical studies are needed to understand the most effective interventions to implement with parents of youth with chronic health conditions.

Implications for research

General design

Research is needed to determine the best way to deliver parent interventions, including the optimal dose, whether interventions should be delivered by trained professionals or paraprofessionals, and whether alternative modes of intervention delivery such as through eHealth or mHealth technologies impacts treatment feasibility and efficacy in clinical settings. At present, it is unknown whether parent interventions delivered alone or in combination with child and/or family/systems treatments are more efficacious. For example, there are some psychotherapy types that are typically delivered only to parents (e.g. PST) whereas other therapy types are delivered to parents and children (e.g. CBT). Research designs that allow for testing of child only, parent only, and parent/child/family interventions will advance this field. Further research to understand how to maximize the effects of parent interventions singly or in combination with specific child interventions is needed.

Given the small sample sizes of many studies in this field, we encourage multi-site investigations to obtain larger samples. Moreover, considerations in research designs are needed for maximizing retention of parents and families in studies through to follow-up assessment points.

At present, there is limited understanding of moderators or mediators of parent interventions. Studies should incorporate consideration of baseline patient, parent or family characteristics that may moderate the effects of treatment and be adequately powered to test these hypotheses. Further, the plausible treatment mechanisms for parent interventions need to be further conceptualized and studied in studies. Measurement of possible mechanisms should occur prior to outcome assessment (such as mid-treatment) in order to test mediation pathways.

Measurement

We found that multiple measurement tools were often used to evaluate one outcome domain in a single study. This practice was particularly problematic for studies that did not identify a-priori the primary outcome. A posteriori selection of outcome measures

is a problem and can increase bias. To address this concern, we recommend that editorial boards implement standards for trial registration and reporting that includes a-priori decisions regarding outcome measurement.

In addition, there was heterogeneity in the measures used to evaluate most of the outcome domains across studies. Work is needed to establish consensus within the field for recommended or appropriate measurement tools to evaluate a given outcome within and across illness groups. Given the inherent challenges in establishing consensus across illness groups, researchers may consider using a combination of disease-specific measures to enhance sensitivity as well as general measures to enhance generalizability.

Finally, we were surprised by the number of studies that did not assess parent or family outcomes even though all of the interventions included in this review were developed to be delivered to parents or families. We recommend that future studies routinely assess parent and family outcomes when parents are directly targeted in treatment.

Other

Since the first version of this review (which included only 13 studies), there has been a large increase in studies and interest in improving parental mental health and parenting behavior among families of children and adolescents with chronic illness. Studies identified in the updated search for this review had several strengths, including more routine use of CONSORT guidelines (Schulz 2010), and relatively larger sample sizes. The next generation of studies should take into account additional limitations identified in this review, including the following.

- Very few studies of FT, MI, and MST met the inclusion criteria for this review. Additional, larger studies of these therapies for children and adolescents with a broad range of illness conditions are needed.
- Replication studies for interventions that have been evaluated by only one research team, such as MST for families of children with diabetes and PST for families of children with TBI.
- There are several subpopulations that have been under-represented in most studies, particularly those of low socioeconomic or minority status, as well as fathers. Research is needed to understand the efficacy of psychological therapies for these groups.
- Research is needed to understand the evidence-base for studies that aim to intervene with mixed samples of youth with chronic illness. We may consider including these studies in a future version of this review.
- Research is needed to understand the feasibility and efficacy of these interventions in developing countries, particularly given predictions that the prevalence of childhood chronic illness will continue to increase worldwide (Liu 2015).
- In this updated search, we found more routine use of CONSORT reporting guidelines and trials registries compared to prior versions of this review. That being said, these practices were not universal across studies and this is an area that deserves attention from study authors and journal editors. Study authors are encouraged to report complete details about their intervention and how it was delivered, including making treatment manuals publicly available. Many journals now have policies requiring trial registry and use of CONSORT guidelines, and we encourage editors to enforce these policies.
- We had some trouble with incomplete reporting of data in published manuscripts. Complete data were available to extract from 25 of 44 studies included in this review. Additionally, authors of 16 studies provided data to us on request, which were missing from the published manuscripts. We rated these studies as having high risk of reporting bias, and our sensitivity analyses indicate that excluding these studies may have changed the findings of our meta-analyses. We support the general move toward central registries for all study data and treatment manuals.
- Finally, piecemeal and repeat publication is an ongoing concern. There were several included studies identified from our updated search where multiple manuscripts were published from the same study. Such practices are unhelpful, create confusion and increase unnecessary labour (American Psychological Association 2011). Many journals now have policies regarding publication of multiple manuscripts from the same study, including a detailed description of previous publications from that study and a statement regarding the unique contribution of the present manuscript (e.g. Drotar 2010). Editors play a crucial role in enforcing these policies, and need to take a proactive approach to identifying such papers during the review process (Committee on Publication Ethics 2011; World Association of Medical Editors 2012).

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* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Ambrosino 2008

Study characteristics	
Methods	RCT. 2 arms. Outcomes assessed at pre-treatment, immediate post-treatment, 3-month, 6-month and 12-month follow-up
Participants	End of treatment n = 87, 3-month follow-up n = 79, 6-month follow-up n = 72, 12-month follow-up n = 72 Start of treatment n = 87 Child sex: 34 M, 53 F

Ambrosino 2008 *(Continued)*

	Parent sex: 5 M, 82 F
	Child age (mean, SD): 9.91 ± 1.44 years
	Parent age (mean, SD): 40.01 ± 5.40 years
	Source: hospital
	Medical condition: type 1 diabetes
	Illness duration (mean): 3.71 years
Interventions	"Coping Skills Training"
	"Group Education"
	Mode of delivery: face-to-face, group
	Intervention delivered by: mental health professional
	Training: not reported
	Duration of intervention (child): 6 x 1.5-h sessions = 9 h
	Duration of intervention (parent): 6 x 1.5-h sessions = 9 h
Outcomes	*Extracted outcome measures used in the analyses
	Child measures
	HbA1c*
	Children's Depression Inventory*
	Issues in Coping with IDDM - Child scale
	Self-Efficacy for Diabetes Scale
	Diabetes Quality of Life Scale for Youth
	Diabetes Family Behavior Scale
	Parent measures
	Center for Epidemiologic Depression Scale*
	Family Adaptability and Cohesion Scale*
	Issues in Coping with IDDM - Parent scale
	Diabetes Responsibility and Conflict scale
Notes	Funding: "This study was supported by grants funded by the National Institute for Nursing Research (National Institute of Health, 1&2R01NR004009)"
	COI: no conflict of interest statement was included in this manuscript

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Participants were randomized initially by a sealed envelope technique and later by computer to either the coping skills therapy of group eduction." Comment: probably done

Ambrosino 2008 *(Continued)*

Allocation concealment (selection bias)	Low risk	Quote: "Participants were randomized initially by a sealed envelope technique and later by computer to either the coping skills therapy of group eduction." Comment: probably done
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Quote: "All follow-up data were collected by trained research assistants." Comment: blinding unclear, probably not done
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition was reported, there were no significant differences between completers and non-completers
Selective reporting (reporting bias)	High risk	Pre-specified outcomes identified in the Methods were not fully reported in the Results. The study authors provided these data on request

Bonnert 2017

Study characteristics	
Methods	RCT. 2 arms. Outcomes assessed at pre-treatment, immediate post-treatment, and 6-month follow-up for the treatment group only
Participants	End of treatment n = 95, 6-month follow-up n = 42 (treatment group only) Start of treatment n = 101 Child sex: 39 M, 62 F Parent sex: not reported Child age (mean, SD): 15.54 ± 1.56 years Parent age: not reported Source: primary care, hospital, community Medical condition: IBS Illness duration (mean): 5.12 years
Interventions	"Exposure-based Internet Cognitive Behavioral Therapy" "Waitlist" Mode of delivery: remote-internet, individual Intervention delivered by: internet + clinical psychologists Training: CBT training Duration of intervention (child): 10 modules over 10 weeks Duration of intervention (parent): 5 modules over 10 weeks
Outcomes	*Extracted outcome measures used in the analyses **Child measures** Gastrointestinal Symptom Rating Scale-IBS

Bonnert 2017 *(Continued)*

	Faces Pain Scale-revised*
	Pain frequency
	Pediatric Quality of Life Inventory
	Pediatric Quality of Life Inventory-Gastro
	IBS-behavioral responses questionnaires
	Visceral Sensitivity Index
	Perceived Stress Scale
	Spence Children's Anxiety Scale*
	Parent measures
	Children's Somatization Inventory
	Pediatric Quality of Life Inventory
	Pediatric Quality of Life Inventory - Gastro
	School absences due to pain*
	Medication use
	Spence Childhood Anxiety Scale - Parent report
Notes	Funding: "The study was supported by grants from the Jan and Dan Olsson Foundation (4-1559/2013), the Swedish Research Council (521-2013-2846), the Kempe-Carlgren Foundation, the Ruth and Richard Julin Foundation (2012Juli0048), the Majblomman Foundation, the Ishizu Matsumurais Donation, the Ihre Foundation (SLS-331861), the Ihre fellowship in Gastroenterology, the Gadelius Foundation, the Samariten Foundation, the Värkstadsstift elsen Foundation, the Swedish Research Council for Health, Working life and Welfare (2014-4052), the Swedish Society of Medicine (SLS-331681 SLS-410501), and the Stockholm County Council (ALF). Financial support was also provided through the regional agreement on medical training and clinical research between Stockholm County Council and Karolinska Institutet (20130129). None of the funding bodies had any influence on study design, implementation, data analysis, or interpretation." COI: "Potential Competing Interests: None"

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "The randomization was conducted by an independent researcher, who received lists with anonymous study ID numbers and used a random number service (www.random.org) to allocate participants." Comment: probably done
Allocation concealment (selection bias)	Low risk	Quote: "The randomization was conducted by an independent researcher, who received lists with anonymous study ID numbers and used a random number service (www.random.org) to allocate participants." Comment: probably done
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "Adolescent and both parents completed all assessments online." Comment: probably done

Bonnert 2017 *(Continued)*

Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Attrition was reported but differences between completers and non-completers were not reported
Selective reporting (reporting bias)	Low risk	Outcomes data were fully reported

Daniel 2015

Study characteristics	
Methods	RCT. 2 arms. Outcomes assessed pre-treatment and immediate post-treatment
Participants	End of treatment n = 62 Start of treatment n = 83 Child sex: 42 M, 41 F Parent sex: not reported Child age (mean, SD): 8.48 ± 2.11 years Parent age: not reported Source: hospital Medical condition: sickle cell Illness duration: lifetime
Interventions	"Families Taking Control" "Delayed Intervention Control" Mode of delivery: face-to-face + remote-telephone, group/individual/family Intervention delivered by: doctoral and masters students and peer patient navigator Training: training in sickle cell disease, PST, and cultural considerations in working with African-American families Duration of intervention (child): 1-day workshop (7 h) + 3 x 30-min booster phone calls over 6 months = 9.5 h Duration of intervention (parent): 1-day workshop (7 h) + 3 x 30-min booster phone calls over 6 months= 9.5 h
Outcomes	*Extracted outcome measures used in the analyses **Child measures** Pediatric Quality of Life Inventory School Subscale - Child report* Woodcock Johnson III (WJ-III) **Parent measures** Pediatric Quality of Life Inventory School Subscale- Parent report

Daniel 2015 *(Continued)*

Notes	Funding: "NHLBI (U54 HL070585) to M.S. (PI), BTRP to LPB (PI); and NCMHD (1RC1MD004418) to L.P.B. (PI)." COI: "Conflicts of interest: None declared."

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Randomization (stratified by gender in blocks of 10) was concealed from the family and the study team until after completing the baseline assessment when an envelope with randomization status was opened and the family was informed of next steps." Comment: insufficient information about the sequence generation process to permit judgement
Allocation concealment (selection bias)	Unclear risk	Quote: "Randomization (stratified by gender in blocks of 10) was concealed from the family and the study team until after completing the baseline assessment when an envelope with randomization status was opened and the family was informed of next steps." Comment: insufficient information about allocation concealment provided to permit judgement; it is unclear if envelopes were sequentially numbered, opaque, and sealed
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Insufficient information to permit judgement; no statement about whether or not blinding of outcome assessment occurred
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition was reported, no significant differences between completers and non-completers are reported
Selective reporting (reporting bias)	Low risk	Outcomes data were fully reported

Doherty 2013

Study characteristics

Methods	RCT. 2 arms. Outcomes assessed at pre-treatment and immediate post-treatment
Participants	End of treatment n = 54 Start of treatment n = 90 Child sex: 45 M, 34 F Parent sex: 1 M, 78 F Child age (mean): 13 years Parent age: 43.5 years Source: community Medical condition: type 1 diabetes

Doherty 2013 *(Continued)*

	Illness duration (mean): 5.17 years
Interventions	"Triple P Diabetes" "Usual Care" Mode of delivery: remote-self-guided book, individual Intervention delivered by: self-guided book Training: not reported Duration of intervention (child): none Duration of intervention (parent): 10 x 1-h modules = 10 h
Outcomes	*Extracted outcome measures used in the analyses **Parent measures** Revised Diabetes Family Conflict Scale* Pediatric Inventory for Parents* Eyberg Child Behavior Inventory* Parenting Scale* Parenting Sense of Competence Scale
Notes	Funding: "This study was supported by a small research grant as part of the University of Manchester Doctorate in Clinical Psychology (F.D.)." COI: "M.S. is the founder and lead author of the Triple P - Positive Parenting Program, and is consultant to Triple P International."

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "A computerized block randomization program ensured equal allocation of participants to one of two groups." Comment: probably done
Allocation concealment (selection bias)	Low risk	Quote: "Blocks consisted of hidden, predetermined sequence of numbers from a computerized random number database prepared by an individual not involved in data collection. Researchers were blind to block size to avoid bias and maintain allocation concealment. Participants had group allocation confirmed after completion of baseline questionnaires. A University employee who constructed the Web site, but was not directly involved with the research project, generated the random allocation sequence." Comment: probably done
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "Detection bias was minimized by using web-administered questionnaires that were self-reported via the Web site...or posted paper-based questionnaires where requested." Comment: probably done
Incomplete outcome data (attrition bias)	Low risk	Attrition was reported and no significant differences between completers and non-completers were detected

Doherty 2013 *(Continued)*
All outcomes

Selective reporting (reporting bias)	Low risk	Outcomes data were fully reported

Ellis 2005

Study characteristics	
Methods	RCT. 2 arms. Outcomes assessed pre-treatment, immediate post-treatment, 12-month follow-up
Participants	End of treatment n = 110, 12-month follow-up = 85 Start of treatment n = 127 children and their families Child sex: 62 M, 65 F Parent sex: not reported Child age (mean, SD): 13.25 ± 1.95 years Parent age: 38.8 ± 6.8 years Source: hospital Medical condition: type 1 diabetes Illness duration (mean): 5.3 years
Interventions	"Multisystemic Therapy" "Standard Care Control" Mode of delivery: face-to-face, family Intervention delivered by: therapist Training: not reported Duration of intervention (child): mean 48 sessions over 5.7 months Duration of intervention (parent): mean 48 sessions over 5.7 months
Outcomes	*Extracted outcome measures used in the analyses **Child measures** HbA1c* Diabetes Stress Questionnaire* Frequency of Blood Glucose Testing from blood glucose meter Health Service Use per Medical Chart Review
Notes	Funding: "This project was supported by grant Ro1 DK59067 from the National Institute of Diabetes and Digestive and Kidney Diseases" COI: "No conflict of interest declared"
Risk of bias	

Ellis 2005 *(Continued)*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Random assignment to treatment group was completed after baseline data collection." Comment: no method described
Allocation concealment (selection bias)	Unclear risk	Quote; "To ensure equivalence across treatment conditions, random assignment was stratified according to HbA1c level at the baseline visit."
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No description found in text Comment: probably not done
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition was reported, there were no significant differences between completers and non-completers
Selective reporting (reporting bias)	Low risk	Outcomes data were fully reported

Ellis 2012

Study characteristics	
Methods	RCT. 2 arms. Assessed at pre-treatment, 7 months post-treatment, 6-month follow-up
Participants	End of treatment n = 117, 6-month follow-up = 117 Start of treatment n = 146 Child sex: 64 M, 82 M Parent sex: not reported Child age (mean, SD): 14.2 ± 2.3 years Parent age: not reported Source: hospital Medical condition: type 1 diabetes Illness duration (mean): 4.7 years
Interventions	"Multisystemic therapy" "Telephone support" Mode of delivery: face-to-face + remote-telephone, family Intervention delivered by: masters-level therapists Training: 5-day training, phone consultation with MST expert, follow-up booster Duration of intervention (child, hours): minimum 2 meetings/week for 6 months Duration of intervention (parent, hours): minimum 2 meetings/week for 6 months
Outcomes	*Extracted outcome measures used in the analyses

Ellis 2012 *(Continued)*

	Child measures HbA1c* Diabetes Management Scale
Notes	Funding: "This project was supported by grant #RO1DK59067 from the National institute of Diabetes, Digestive and Kidney diseases" COI: "Conflict of interest statement: three of the authors are board members of Evidence Based Services, which has a licensing agreement with MST Services, which has a licensing agreement with MST Services, LLC, for dissemination of multisystemic therapy treatment technology. There are no other potential author conflicts of interest"

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Participants were randomized in a 1:1 ratio to MST or telephone support. Randomization occurred immediately after baseline data collection using a permuted block algorithm to ensure equivalence across treatment condition..." Comment: probably done
Allocation concealment (selection bias)	Low risk	Quote: "The project statistician generated the randomization sequence and participants were notified of their randomization status by the project manager." Comment: probably done
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "All measures were collected by a trained research assistant in the participants' homes. The research assistant was blind to treatment assignment to the extent possible in a behavioral trial." Comment: probably done
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Attrition was reported, but no data were presented describing equivalence between completers and non-completers
Selective reporting (reporting bias)	Low risk	Outcomes data fully reported

Ellis 2017a

Study characteristics

Methods	RCT. 3 arms. Assessed pre-treatment and 1-month follow-up (7 months post-baseline)
Participants	End of treatment n = 56 Start of treatment n = 67 Child sex: not reported Parent sex: 28 M, 36 F Child age (mean, SD): 12.1 ± 1.3 years

Ellis 2017a *(Continued)*

	Parent age (mean, SD): 38.3 ± 6.6 years Source: hospital Medical condition: type 1 diabetes Illness duration (mean): 4.6 years
Interventions	"3Ms diabetes" "Attention Control Intervention" Mode of delivery: arm 1: remote-internet, individual/arm 2: remote-internet, individual Intervention delivered by: both arms, internet Training: not reported Duration of intervention (child): arm 1, 3 sessions of motivational interviewing/arm 2, 3 sessions of psychoeducation Duration of intervention (parent): arm 1, 3 sessions of motivational interviewing/arm 2, 3 sessions of motivational interviewing
Outcomes	*Extracted outcome measures used in the analyses **Child measures** HbA1c* Parent-Adolescent Relationship Questionnaire* **Parent measures** Knowledge of need to monitor adolescent diabetes management Rollnick's Readiness Ruler Parental Monitoring of Diabetes Care Scale-Revised*
Notes	Funding: "This work was supported, in part, by funding from the National Institutes of Diabetes, Digestive and Kidney Disease (Grant No. R21 DK089238-01)—Dr. Ellis—PI." COI: "Dr. Ondersma is part owner of Interva, a company that markets the CIAS intervention authoring tool used to develop the intervention for this study."

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Families enrolled were randomly assigned to one of 3 treatment arms." Comment: insufficient information is provided about the sequence generation to permit judgement
Allocation concealment (selection bias)	Unclear risk	Quote: "Families enrolled were randomly assigned to one of 3 treatment arms." Comment: insufficient information is provided about the method of concealment to permit judgement
Blinding of outcome assessment (detection bias)	Low risk	Quote: "All data collection measures and the intervention content were administered using Internet-based software on a touch screen tablet computer."

Ellis 2017a *(Continued)*

All outcomes		Comment: probably done
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Attrition was reported but differences between completers and non-completers were not reported
Selective reporting (reporting bias)	High risk	Pre-specified outcomes identified in the Methods were not fully reported in the Results. The study authors provided these data on request

Ellis 2017b

Study characteristics	
Methods	RCT. 2 arms. Assessed baseline and post-treatment
Participants	End of treatment n = 44 Start of treatment n = 50 Child sex: 18 M, 29 F Parent sex: 2 M, 45 F Child age (mean, SD): 14.3 ± 2.4 years Parent age: 41.7 ± 7.5 years Source: hospital Medical condition: type 1 diabetes Illness duration (mean): 6.7 years
Interventions	"REACH for control" "Standard medical care" Mode of delivery: face-to-face, family Intervention delivered by: community health workers Training: CHW competency training by Michigan Community Health Worker Alliance plus protocol-specific training in an 80-h, 2-week-long training period Duration of intervention (child): twice weekly 30-90-min sessions for 20 weeks Duration of intervention (parent): twice weekly 30-90-min sessions for 20 weeks
Outcomes	*Extracted outcome measures used in the analyses **Child measures** HbA1c* Diabetes Management Scale Diabetes Quality of Life-Youth Scale **Parent measures** Diabetes Management Scale

Ellis 2017b *(Continued)*

Notes	Funding: "This work was supported by funding from the National Institute of Diabetes Digestive and Kidney Disease of the National Institutes of Health (R34 DK102091-01, PI)." COI: "Conflicts of interest: None declared."

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Participants were randomized in a 1:1 ratio to RFC [REACH for Control] plus standard medical care or standard medical care alone. Randomization occurred immediately after baseline data collection using a permuted block algorithm with blocks of varying size to ensure equivalence across treatment condition and was conducted by the project co investigator using a computerized software package (http://randomization.com)"
Allocation concealment (selection bias)	Low risk	Quote: "...was conducted by the project co investigator using a computerized software package (http://randomization.com)...treatment assignment was then provided to the research assistant collecting the data who informed the family of their status....The research assistant was not blind to treatment assignment because of the need to complete exit interviews to assess treatment satisfaction with treatment families."
Blinding of outcome assessment (detection bias) All outcomes	High risk	Quote: "To minimize bias, data collection was conducted by research assistants hired by the university research partner rather than the CHW interventionists....The research assistant was not blind to treatment assignment because of the need to complete exit interviews to assess treatment satisfaction with treatment families."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition was reported, there were no significant differences between completers and non-completers
Selective reporting (reporting bias)	Low risk	Outcomes data were fully reported

Greenley 2015

Study characteristics

Methods	RCT. 3 arms. Assessed pre-treatment, after initial treatment (12 weeks), after additional treatment (20 weeks)
Participants	End of initial treatment (12 weeks) n = 65, end of additional treatment (20 weeks) n = 65 Start of treatment n = 76 Child sex: 46 M, 30 F Parent sex: not reported Child age (mean, SD): 14.5 ± 1.8 years Parent age: not reported Source: hospital Medical condition: IBD

Greenley 2015 *(Continued)*

	Illness duration: not reported
Interventions	"Problem Solving Skills Training Irritable Bowel Disease" "Waitlist" Mode of delivery: arm 1: face-to-face + remote-telephone, family. Arm 2: face-to-face + remote-telephone, family Intervention delivered by: graduate students in psychology Training: 10 h of PSST training Duration of intervention (child): arm 1, 2 sessions; arm 2, 4 sessions (session 1: 75 mins, other sessions: 45 mins) Duration of intervention (parent): arm 1, 2 sessions; arm 2: 4 sessions (session 1: 75 mins, other sessions: 45 mins)
Outcomes	*Extracted outcome measures used in the analyses **Child measures** MEMS Track Caps electronic monitor Pediatric Quality of Life Inventory (PedsQL)
Notes	Funding: "Supported by the Crohn's and Colitis Foundation of America (Senior Research Award #2838; PI: Greenley)." COI: "The authors have no conflicts of interest to disclose."

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "The randomization sequence was generated by a biostatistician using Windows version 6.0 of randomization program 'Rand.exe.'" Comment: probably done
Allocation concealment (selection bias)	Low risk	Quote: "The random allocation sequence was stored electronically in a password-protected file accessible only to the research assistant in charge of informing participants of randomization outcomes. Research assistants enrolling participants and those conducting assessment visits were blind to participant intervention condition." Comment: probably done
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "All assessments were conducted in participants' homes...Research assistants...conducting assessment visits were blind to participant intervention condition." Comment: probably done
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Attrition was reported but differences between completers and non-completers were not reported
Selective reporting (reporting bias)	Low risk	Outcomes data were fully reported

Hoekstra-Weebers 1998

Study characteristics	
Methods	RCT. 2 arms. Pre-treatment (at diagnosis), post-treatment, 6-month follow-up
Participants	End of treatment and 6-month follow-up n = 81 Start of treatment n = 120 Parent sex: 40 M, 41 F Child sex: 23 M, 18 F Child age (mean, SD): 6.4 ± 4.7 years Parent age: 36.6 ± 5.4 years Source: hospital Medical condition: cancer Illness duration (range): 2-21 days post diagnosis
Interventions	"Psychoeducational and Cognitive-Behavioral Intervention" "Standard Care Control" Mode of delivery: face-to-face, individual Intervention delivered by: psychologist Training: not reported Duration of intervention (child): 0 Duration of intervention (parent): 8 sessions x 90 mins = 12 h
Outcomes	*Extracted outcome measures used in the analyses **Parent measures** Symptom Check List (SCL) State-Trait Anxiety Inventory-State* Goldberg General Health Questionnaire Social Support List-Discrepancies Intensity of emotions list
Notes	Funding: "This study has been funded by the Dutch Cancer Society and the Pediatric Oncology Foundation Groningen" COI: no conflict of interest statement included in the manuscript

Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Quote: "Parents were randomly assigned.... parents drew one of two envelopes in which a letter indicated in which group they were placed."

Hoekstra-Weebers 1998 *(Continued)*

		Comment: method unclear
Allocation concealment (selection bias)	Unclear risk	Quote: "Parents were randomly assigned.... parents drew one of two envelopes in which a letter indicated in which group they were placed." Comment: probably done but unsure whether envelopes were sealed or numbered
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No description found in text Comment: probably not done
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition was reported, there were no significant differences between completers and non-completers
Selective reporting (reporting bias)	Low risk	Outcomes data were fully reported

Husted 2014

Study characteristics	
Methods	RCT. 2 arms. Assessed pre-treatment, post-treatment, 6-month follow-up
Participants	End of treatment n = 57, 12-month follow-up n = 53 Start of treatment n = 71 Child sex: 28 M, 43 F Parent sex: not reported Child age (mean, SD): 14.8 ± 1.4 years Parent age: not reported Source: hospital/primary care Medical condition: type 1 diabetes Illness duration (mean): 5.7 years
Interventions	"Self-determination Diabetes" "Treatment as usual" Mode of delivery: face-to-face, individual/family Intervention delivered by: pediatric physicians, pediatric diabetes nurses, dieticians, and reflection sheets Training: not reported Duration of intervention (child): 8 sessions x 1 h = 8 h Duration of intervention (parent): 8 sessions x 1 h = 8 h
Outcomes	*Extracted outcome measures used in the analyses **Child measures**

Husted 2014 *(Continued)*

	HbA1c*
	Perceived Competence in Diabetes Scale
	Health Care Climate Questionnaire
	Treatment Self-Regulation Questionnaire
	Problem Areas in Diabetes
	World Health Organization-5 scale*
	Perception of Parents Scale*
Notes	Funding: "This trial was supported by grants from the Research Foundation at Hillerød Hospital, the Novo Nordisk Foundation, the Lundbeck Foundation, the Sahva Foundation, the Tryg Foundation, the Foundation of Senior Lieutenant Harald Jensen and Wife, the Pediatric Department at Hillerød Hospital, the Research Foundation of the Capital Region of Denmark, the Foundation of Mrs. Lily Benthine Lund, the Axel Muusfeldt Foundation, the Foundation of Master Cabinetmaker Sophus Jacobsen and his wife Astrid Jacobsen, the Ville Heise Foundation, the Beckett Foundation, and the Health Insurance Foundation. GRH received the grants." COI: "Competing interests: None declared."

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "The adolescents were randomized using opaque sealed envelopes containing a twice-folded piece of paper indicating the group assignment; these assignments were prepared in blocks of 4, each comprising two GSD-Y intervention assignments and two usual-care assignments. The 4 envelopes in each block were randomly mixed and then consecutively numbered from one to 4 by GRH (primary author)." Comment: probably done
Allocation concealment (selection bias)	Low risk	Quote: "The adolescents were randomized using opaque sealed envelopes containing a twice-folded piece of paper indicating the group assignment; these assignments were prepared in blocks of 4, each comprising two GSD-Y intervention assignments and two usual-care assignments. The 4 envelopes in each block were randomly mixed and then consecutively numbered from one to 4 by GRH (primary author)." Comment: probably done
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Quote: "The scales were compiled into one questionnaire and completed by the adolescents in the clinic at baseline, before randomization, at the end of the experimental period, and after a 6-month follow-up period." Comment: insufficient information provided about detection bias to permit judgement
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Attrition is reported but differences between completers and non-completers are not reported
Selective reporting (reporting bias)	Low risk	Outcomes data were fully reported

Kashikar-Zuck 2012

Study characteristics	
Methods	RCT, cross-over design. 2 arms. Assessed pre-treatment, post-treatment, 6-month follow-up
Participants	End of treatment n = 100, 12-month follow-up n = 100 Start of treatment n = 114 Child sex: 9 M, 105 F Parent sex: not reported Child age (mean, SD): 15.0 ± 1.8 years Parent age: not reported Source: hospital Medical condition: juvenile fibromyalgia Illness duration (mean): 2 years
Interventions	"Cognitive behavioral therapy" "Fibromyalgia education" Mode of delivery: face-to-face, individual Intervention delivered by: psychology post-doctoral fellows Training: 6- to 8-h training + ongoing supervision Duration of intervention (child): 8 sessions x 45 min = 6 h Duration of intervention (parent): 3 sessions x 45 min = 2 h, 15 mins
Outcomes	*Extracted outcome measures used in the analyses **Child measures** Child Depression Inventory* Functional Disability Inventory* Pain severity-visual analogue scale* Sleep quality-visual analogue scale Pediatric Quality of Life Inventory Tender point sensitivity using dolorimetry Physician's global assessment
Notes	Funding: "Supported by the NIH (National Institute of Arthritis and Musculoskeletal and Skin Diseases grant R01-AR-050028 to Dr. Kashikar-Zuck)." COI: "Dr. Passo has received consulting fees, speaking fees, and /or honoraria from Pfizer (less than $10,000)."
Risk of bias	

Kashikar-Zuck 2012 *(Continued)*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Eligible patients were randomly assigned to 1 of the 2 treatment arms based upon a computer-generated randomization list. Randomisation was stratified by site." Comment: probably done
Allocation concealment (selection bias)	Low risk	Quote: "When a patient was enrolled, the study therapist contacted the biostatistician to obtain the subject identification number and treatment allocation." Comment: probably done
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "The principle investigator, study physicians, study coordinator, and assessment staff were all blinded to the patients' treatment condition throughout the trial. Patients were asked not to divulge what treatment they were receiving to the study physician." Comment: probably done
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition was reported, and there were no significant differences between completers and non-completers
Selective reporting (reporting bias)	Low risk	Outcomes data were fully reported

Kazak 2004

Study characteristics	
Methods	RCT. 2 arms. Assessed pre-treatment and 3-5 months post-treatment
Participants	End of treatment n = 116 children Start of treatment n = 150 children Child sex: 73 M, 77 F Parent sex: 106 M, 146 F Child age (mean, SD): 14.61 ± 2.4 years Parent age: not reported Source: hospital Medical condition: cancer Illness duration (mean): 5.3 years
Interventions	"Surviving Cancer Competently Intervention Program (SCCIP)" "Wait-list Control" Mode of delivery: face-to-face, group Intervention delivered by: nurses, social workers, psychologists, graduate and post-doctoral psychology trainees

Kazak 2004 *(Continued)*

	Training: 12-h training including didactics, readings, role play, observation Duration of intervention (child): 1-day workshop = 7 h Duration of intervention (parent): 1-day workshop = 7 h
Outcomes	*Extracted outcome measures used in the analyses **Child measures** Post-Traumatic Stress Disorder Reaction Index Impact of Events Scale-Revised Revised Children's Manifest Anxiety Scale **Parent measures** Post-Traumatic Stress Disorder Reaction Index Impact of Events Scale-Revised State-Trait Anxiety Inventory
Notes	Funding: "This research was funded by a grant from the National Cancer Institute (CA63930) and a grant from the Abramson Cancer Center of The University of Pennsylvania (CA15488)" COI: no conflict of interest statement included in the manuscript

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Families were randomized to the treatment or wail-list control condition." Comment: method not described
Allocation concealment (selection bias)	Unclear risk	No description found in text Comment: probably not done
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No description found in text Comment: probably not done
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Attrition was reported, but no data were presented describing equivalence between completers and non-completers
Selective reporting (reporting bias)	High risk	Pre-specified outcomes identified in the Methods were not fully reported in the Results. The study authors did not provide these data when requested

Laffel 2003

Study characteristics	
Methods	RCT. 2 arms. Assessed at pre-treatment and 1 year
Participants	End of treatment n = 100 children

Laffel 2003 *(Continued)*

	Start of treatment n = 105
	Child sex: 53 M, 47 F
	Parent sex: not reported
	Child age (mean, SD): 12.1 ± 2.3 years
	Parent age: not reported
	Source: hospital
	Medical condition: type 1 diabetes
	Illness duration (mean): 2.7 years
Interventions	"Teamwork Intervention"
	"Standard Care"
	Mode of delivery: face-to-face, family
	Intervention delivered by: research assistant
	Training: not reported
	Duration of intervention (child): 4 sessions over 1 year (h not reported)
	Duration of intervention (parent): 4 sessions over 1 year (hours not reported)
Outcomes	* Extracted measures used in the analysesExtracted outcome measures used in the analyses
	Child measures
	A1c*
	Diabetes Family Conflict Scale
	Clinician Report of Adherence to Diabetes Management Tasks
	Diabetes Family Responsibility Questionnaire
	Joint structured interview to assess parental involvement in diabetes management tasks
	Pediatric Quality of Life Inventory
	Parent measures
	Diabetes Family Conflict Scale*
	Diabetes Family Responsibility Questionnaire
	Joint structured interview to assess parental involvement in diabetes management tasks
Notes	Funding: "Supported by a grant (DK-46887) from the National Institute of Diabetes, Digestive and Kidney Diseases, the Charles H. Hood Foundation, and the Katherine Adler Astrove Youth Education Fund"
	COI: no conflict of interest statement included in the manuscript

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	"Patients were randomly assigned according to age and duration." Comment: method not described

Laffel 2003 *(Continued)*

Allocation concealment (selection bias)	Unclear risk	No description found in text. Comment: probably not done
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No description found in text. Comment: probably not done
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Attrition was reported but was not adequately described to make a judgement
Selective reporting (reporting bias)	Low risk	Outcomes data were fully reported

Law 2015

Study characteristics	
Methods	RCT. 2 arms. Assessed at pre-treatment, post-treatment (8-10 weeks), 4-month follow-up
Participants	End of treatment n = 59, 6-month follow-up n = 49 Start of treatment n = 83 Child sex: 15 M, 68 F Parent sex: not reported Child age (mean, SD): 14.5 ± 1.7 years Parent age: not reported Source: hospital Medical condition: headache Illness duration: not reported
Interventions	"Web-based Management of Adolescent Pain (Web-MAP)" "Specialized Headache Clinic" Mode of delivery: remote-internet, individual Intervention delivered by: internet + PhD-level psychology postdoctoral fellow Training: not reported Duration of intervention (child): 8 modules x 30 min = 4 h Duration of intervention (parent): 8 modules x 30 min = 4 h
Outcomes	*Extracted outcome measures used in the analyses **Child measures** Headache Frequency* Pain Intensity (11-point numerical rating scale) Child Activity Limitation Interview-21*

Law 2015 *(Continued)*

	Revised Children's Manifest Anxiety Scale, Second Edition Children's Depression Inventory* Actiwatch 64 **Parent measures** Adult Responses to Children's Symptoms*
Notes	Funding: "This research was supported by Grant K24HD060068 from the National Institutes of Health/ National Institute of Child Health and Human Development (PI: Palermo)." COI: "Conflict of interest statement: No conflicts."

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Blocked randomization with blocks of 10 was used to assign participants to one of the two treatment conditions. An online number generator was used to produce the blocked randomization. Participants were allocated in a 1:1 ratio." Comment: probably done
Allocation concealment (selection bias)	Low risk	Quote: "Group assignments were identified by ID number in an excel spreadsheet that was password protected and accessible only to a research coordinator who was blinded to participant recruitment, screening, and informed consent. Following completion of all pre-treatment assessments, the research coordinator accessed the excel spreadsheet to reveal the group assignment. This information was then programmed into the Web-MAP system, which generated a message on the web site to each study participant revealing the instructions for their treatment assignment." Comment: probably done
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "A research coordinator who was blinded to group status conducted all assessment procedures that occurred in the clinic." Comment: probably done
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition was reported and there were no differences between completers and non-completers
Selective reporting (reporting bias)	Low risk	Outcomes data were fully reported

Levy 2010

Study characteristics

Methods	RCT. 2 arms. Assessed at pre-treatment, post-treatment, 3-month follow-up, 6-month follow-up
Participants	End of treatment n = 168, 3-month follow-up n = 143, 6-month follow-up n = 154 Start of treatment n = 200

Levy 2010 *(Continued)*

	Child sex: 55 M, 145 F
	Parent sex: 12 M, 188 F
	Child age (mean, SD): 11.2 ± 2.6 years
	Parent age (mean, SD) = 43.8 ± 6.4 years
	Source: hospital
	Medical condition: functional abdominal pain
	Illness duration: not reported
Interventions	"Cognitive-behavioral treatment"
	"Educational intervention"
	Mode of delivery: face-to-face, family
	Intervention delivered by: master's-level therapist
	Training: not reported
	Duration of intervention (child): 3 sessions x 75 min = 4 h
	Duration of intervention (parent): 3 sessions x 75 min = 4 h
Outcomes	*Extracted outcome measures used in the analyses
	Child measures
	Functional Disability Inventory*
	Faces Pain Scale-Revised*
	Child Depression Inventory*
	Child Somatization Inventory
	Multidimensional Anxiety Scale for Children
	Parent measures
	Functional Disability Inventory
	Faces Pain Scale-Revised
	Child Somatization Inventory
Notes	Funding: "This study was supported by grant number 5R01HD036069 from the National Institutes of Health - National Institute of Child Health and Human Development." COI: "Potential competing interests: William E. Whitehead is a member of the Board of Directors of the Rome Foundation. Nader Youssef is currently the Director of Clinical Research at AstraZeneca LP. At the time the study was conducted, however, he was not affiliated with this company and contributed to this project by his appointment at Goryeb Children's Hospital."

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Randomisation was then performed by a different researcher using a computerized random-number generator, stratifying by age."

Levy 2010 *(Continued)*

		Comment: probably done
Allocation concealment (selection bias)	Low risk	Quote: "Randomisation was then performed by a different researcher using a computerized random-number generator, stratifying by age." Comment: probably done
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "Nurse assessors were blind to the treatment assignment of the children." Comment: probably done
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Attrition was reported, but no data were presented describing equivalence between completers and non-completers
Selective reporting (reporting bias)	High risk	Pre-specified outcomes identified in the Methods were not fully reported in the Results. The study authors provided these data on request

Levy 2016

Study characteristics	
Methods	RCT. 2 arms. Assessed pre-treatment, 1 week post-treatment, 3-month follow-up, 6-month follow-up, 12-month follow-up
Participants	End of treatment n = 150, 3-month follow-up n = 139, 6-month follow-up n = 141, 12-month follow-up n = 138 Start of treatment n = 185 Child sex: 98 M, 87 F Parent sex: 18 M, 167 F Child age (mean, SD): 13.5 ± 2.7 years Parent age (mean, SD): 44.4 ± 6.9 years Source: hospital Medical condition: IBD Illness duration: not reported
Interventions	"Social Learning Cognitive Behavioral Therapy Irritable Bowel Disease (SLCBT IBD)" "Educational Support" Mode of delivery: face-to-face, individual/family Intervention delivered by: master's-level therapist Training: not reported Duration of intervention (child): 3 sessions x 75 min = 4 h Duration of intervention (parent): 3 sessions x 75 min = 4 h
Outcomes	*Extracted outcome measures used in the analyses

Levy 2016 *(Continued)*

	Child measures Pain Response Inventory Pain Beliefs Questionaire IMPACT-III (IBD Quality of Life) Child Depression Inventory* Multidimensional Anxiety Scale for Children Functional Disability Inventory* **Parent measures** Adults' Responses to Children's Symptoms* Pain Response Inventory Pain Beliefs Questionnaire Number of hospital stays and doctor's visits for IBD Days of school missed due to GI symptoms Functional Disability Inventory
Notes	Funding: "Supported by a grant from the Eunice Kennedy Shriver National Institute of Child Health and Human Development (award number R01HD050345 to R. L. Levy)." COI: "The authors have no conflict of interest to disclose."

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Randomization was then performed by a different researcher using a computerized random-number generator" Comment: probably done
Allocation concealment (selection bias)	Low risk	Quote: "Randomization was then performed by a different researcher using a computerized random-number generator" Comment: probably done
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "At all assessment points, parents completed questionnaires online or by mail (whichever modality they preferred). Children completed assessments through a scheduled telephone call with a highly trained research nurse who was blinded to the participant's treatment assignment." Comment: probably done
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Attrition was reported, but no data were presented describing equivalence between completers and non-completers
Selective reporting (reporting bias)	High risk	Pre-specified outcomes identified in the Methods were not fully reported in the Results. The study authors provided these data on request

Levy 2017

Study characteristics	
Methods	RCT. 3 arms. Assessed pre-treatment, 1 week post-treatment, 3-month follow-up, 6-month follow-up
Participants	End of treatment n = 243, 3-month follow-up n = 235, 6-month follow-up n = 234 Start of treatment n = 316 Child sex: 112 M, 204 F Parent sex: 16 M, 300 F Child age (mean, SD): 9.4 ± 1.7 years Parent age (mean, SD): 39.9 ± 7.4 years Source: hospital Medical condition: functional abdominal pain Illness duration: not reported
Interventions	"Social Learning and Cognitive Behavioral Therapy Functional Abdomnial Pain (SLCBT FAP)" "Social Learning and Cognitive Behavioral Therapy Remote (SLCBT Remote), education or support" Mode of delivery: arm 1, face-to-face, individual. Arm 2, remote-telephone, individual Intervention delivered by: both arms, advanced clinical psychology graduate students, or master's-level social workers Training: treatment manual + training including didactics, observation, role play Duration of intervention (child): none Duration of intervention (parent): 3 sessions x 60 min = 3 h
Outcomes	*Extracted outcome measures used in the analyses **Child measures** Abdominal Pain Index* Pain Response Inventory* Children's Somatization Inventory Pediatric Quality of Life Inventory Functional Disability Inventory* **Parent measures** Adults' Responses to Children's Symptoms* Pain Beliefs Questionnaire Pain Catastrophizing Scale-Parent self-report* Functional Disability Inventory Number of hospital stays and doctor's visits Days of school missed

Levy 2017 *(Continued)*

	Pain Behavior Check List Children's Somatization Inventory Pediatric Quality of Life Inventory
Notes	Funding: "This study was supported by award R01HD36069-0981 from the Eunice Kennedy Shriver National Institute of Child Health and Human Development (R.L.L.)." COI: "Conflict of interest statement: The authors have no conflicts of interest relevant to this article to disclose."

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Randomization using a computer-generated randomization sequence occurred after baseline assessments" Comment: probably done
Allocation concealment (selection bias)	Low risk	Quote: "Recruiters and physicians were blind to treatment assignment. After enrolment and completion of baseline assessments, the study coordinator queried the randomization database for treatment assignment" Comment: probably done
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "Parents completed questionnaires online or by mail (90.5% online). Children completed assessments through a telephone call with a trained interviewer blinded to study hypotheses and treatment assignment." Comment: probably done
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Attrition was reported, but no data were presented describing equivalence between completers and non-completers
Selective reporting (reporting bias)	High risk	Pre-specified outcomes identified in the Methods were not fully reported in the Results. The study authors provided these data on request

May 2017

Study characteristics

Methods	RCT. 2 arms. Assessed pre-treatment and post-treatment (same day as intervention)
Participants	End of treatment n = 79 Start of treatment n =79 Child sex: 35 M, 44 F Parent sex: 11 M, 68 F Child age (mean, SD): 14.9 ± 1.5 years Parent age: not reported Source: hospital

May 2017 *(Continued)*

	Medical condition: type 1 diabetes Illness duration (mean): 8.8 years
Interventions	"Motivational Interviewing" "Education" Mode of delivery: face-to-face, individual Intervention delivered by: clinical psychology doctoral student Training: quarterly supervision from a paediatric psychologist Duration of intervention (child): none Duration of intervention (parent): 1 x 30-min session
Outcomes	*Extracted outcome measures used in the analyses **Child measures** Inclusion of Others in the Self scale (IOS)* Measure of Intimate Events (MIE) Observed communication **Parent measures** Inclusion of Others in the Self scale (IOS) Measure of Intimate Events (MIE) Observed communication*
Notes	Funding: "Financial support provided by Wayne State University and Beaumont Health Systems HIC #2013 0 470." COI: "Conflicts of interest: None declared."

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Families were then randomized to intervention or control using a flip book with a pre assigned randomization number (to ensure that the interventionist remained blind to the dyads' group assignments during the initial rating of communication skills)." Comment: randomization probably done but flip book method is unclear
Allocation concealment (selection bias)	Low risk	Quote: "Families were then randomized to intervention or control using a flip book with a pre-assigned randomization number (to ensure that the interventionist remained blind to the dyads' group assignments during the initial rating of communication skills)." Comment: probably done
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "Both discussion tasks were video-recorded for later coding by independent, blinded coders." Comment: probably done

May 2017 *(Continued)*

Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition was reported; there was no participant dropout
Selective reporting (reporting bias)	Low risk	Outcomes data were fully reported

Mayer-Davis 2015

Study characteristics	
Methods	RCT. 2 arms. Assessed pre-treatment and 1-month follow-up (4 months post-baseline)
Participants	End of treatment n = 58 Start of treatment n = 61 Child sex: not reported Parent sex: not reported Child age (mean, SD): 13.9 ± 1.4 years Parent age: not reported Source: hospital Medical condition: type 1 diabetes Illness duration (mean): 7.4 years
Interventions	"FL3X Diabetes" "Usual care" Mode of delivery: face-to-face, individual Intervention delivered by: pediatric diabetes clinicians/educators Training: 2-day motivational interviewing training and 2-day recruitment and intervention workshop, continuous training and supervision calls weekly Duration of intervention (child): 3 sessions + 2 optional sessions (40-60 min each) = 3-5 h Duration of intervention (parent): 3 sessions + 2 optional sessions (40-60 min each) = 3-5 h
Outcomes	*Extracted outcome measures used in the analyses **Child measures** HbA1c* Pediatric Diabetes Quality of Life Pediatric Quality of Life 4.0
Notes	Funding: "Funding was received from the National Institutes of Health (R21-DK085483; to E.J.M.-D. and M.S.)." COI: "Competing interests: None declared."

Mayer-Davis 2015 *(Continued)*

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Participants were randomized, within each clinical site, electronically via a predetermined allocation embedded within the study web site" Comment: probably done
Allocation concealment (selection bias)	Low risk	Quote: "Participants were randomized, within each clinical site, electronically via a predetermined allocation embedded within the study web site" Comment: probably done
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Quote: "Baseline and 4-month end-of-study measures were collected in person." Comment: insufficient information provided on detection bias to permit judgement
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Attrition was reported, but no data were presented describing equivalence between completers and non-completers
Selective reporting (reporting bias)	Low risk	Outcomes data were fully reported

Morawska 2016

Study characteristics	
Methods	RCT. 2 arms. Assessed pre-treatment, post-treatment (4 weeks), 6-month follow-up
Participants	End of treatment n = 83, 6-month follow-up n = 75 Start of treatment n = 107 Child sex: 56 M, 51 F Parent sex: not reported Child age (mean, SD): 5.0 ± 2.2 years Parent age: 37.3 years Source: hospital, community Medical condition: asthma, eczema Illness duration (mean): 4.1 years (eczema), 2.3 years (asthma)
Interventions	"Triple P Asthma/Eczema" "Care as usual" Mode of delivery: face-to-face, group Intervention delivered by: psychologists or nurses Training: all study therapists had Triple P accreditation

Morawska 2016 *(Continued)*

	Duration of intervention (child): none Duration of intervention (parent): 2 sessions x 2 h = 4 h
Outcomes	*Extracted outcome measures used in the analyses **Parent measures** Parents' Self-Efficacy with Eczema Care Index* Asthma Parent Tasks Checklist* Eczema Behavior Checklist* Asthma Behavior Checklist* Pediatric Quality of Life 4.0 PedsQL Family Impact Module* Patient-Oriented Eczema Measure* Asthma episode frequency and severity* Observed at-home medical management
Notes	Funding: "This research was supported by the Australian Research Council DP110102449." COI: "The Triple P - Positive Parenting Program is owned by The University of Queensland. The University, through its main technology transfer company, UniQuest Pty Ltd, has licensed Triple P International Pty Ltd to publish and disseminate the program worldwide. Royalties stemming from published Triple P resources are distributed in accordance with the University's intellectual property policy and flow to the Parenting and Family Support Centre, School of Psychology, Faculty of Health and behavioral Sciences, and contributory authors. No author has any share or ownership in Triple P International Pty Ltd. Alina Morawska is an author of various Triple P resources including that reported in this study. Amy Mitchell is a staff member employed at the Parenting and Family Support Centre. The other authors have no potential conflicts of interest or financial relationships relevant to this article to disclose."

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Allocation was by block randomization, using computer-generated randomly-selected block sizes (4, 6, or 8 participants per block) and random group allocation within each block. An external researcher generated random allocation sequences, and prepared sequentially-numbered opaque envelopes to conceal group allocation. Envelopes were assigned by a research assistant in the order families completed T1 assessment." Comment: probably done
Allocation concealment (selection bias)	Low risk	Quote: "Allocation was by block randomization, using computer-generated randomly-selected block sizes (4, 6, or 8 participants per block) and random group allocation within each block. An external researcher generated random allocation sequences, and prepared sequentially-numbered opaque envelopes to conceal group allocation. Envelopes were assigned by a research assistant in the order families completed T1 assessment." Comment: probably done
Blinding of outcome assessment (detection bias)	Unclear risk	Quote: "Prior to randomization, participants completed T1 assessment, consisting of: parent-reported questionnaires, in online (n = 95) or hardcopy (n =

Morawska 2016 *(Continued)*

All outcomes		12) format depending on parent preference; two weeks of symptom monitoring; and participation in an observation of a typical home treatment session." Comment: insufficient information provided on detection bias to permit judgement, particularly on observation of home management
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Attrition was reported, but no data were presented describing equivalence between completers and non-completers
Selective reporting (reporting bias)	High risk	Pre-specified outcomes identified in the Methods were not fully reported in the Results. The study authors provided these data on request

Naar-King 2014

Study characteristics	
Methods	RCT, 2 arms. Assessed at pre-treatment, post-treatment = 7 months after baseline data collection
Participants	End of treatment n = 153 Start of treatment n = 170 Child sex: 102 M, 65 F Parent sex: not reported Child age (mean, SD): 13.5 ± 1.3 years Parent age: not reported Source: hospital Medical condition: asthma Illness duration: not reported
Interventions	"Multisystemic Therapy–Health Care" "Family support" Mode of delivery: face-to-face, family Intervention delivered by: master's-level therapist Training: 5-day training, weekly consultation with MST expert, quarterly booster training Duration of intervention (child): mean 31 sessions, range 0-62 Duration of intervention (parent): mean 31 sessions, range 0-62
Outcomes	*Extracted outcome measures used in the analyses **Child measures** Rollnicks Readiness Ruler Family Asthma Management System Scale* Adherence to daily corticosteroid medication

Naar-King 2014 *(Continued)*

	Lung function (FEV1)*
Notes	Funding: "This research was supported by a grant from the National Institute of Health (1R01AA022891-01)" COI: "Philip Cunningham is co-owner of Evidence Based Services."

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Randomization was stratified based on (1) severity of asthma complications as indicated by the number of recent hospitalizations.... (2) receipt of asthma specialty care (...)." Comment: method not described
Allocation concealment (selection bias)	Unclear risk	No description found in text Comment: probably not done
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "Baseline data collection, including spirometry, subsequently occurred in the home by trained research assistants. All data collectors were blind to the participant's study condition." Comment: probably done
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition was reported and data were presented describing equivalence between completers and non-completers
Selective reporting (reporting bias)	High risk	Pre-specified outcomes identified in the Methods were not fully reported in the Results. The study authors provided these data on request

Nansel 2009

Study characteristics

Methods	RCT, 2 arms. Assessed at pre-treatment, 3 weeks after last clinic visit post-treatment
Participants	End of treatment n = 116 Start of treatment n = 122 Child sex: not reported Parent sex: not reported Child age (mean): 11.5 years Parent age: not reported Source: hospital Medical condition: type 1 diabetes Illness duration: 5.8 years
Interventions	"WE*CAN intervention"

Nansel 2009 *(Continued)*

	"Usual Care Comparison" Mode of delivery: face-to-face + remote-telephone, family Intervention delivered by: health advisors (college graduates) Training: not reported Duration of intervention (child): 3 sessions and 9 phone calls Duration of intervention (parent): 3 sessions and 9 phone calls
Outcomes	*Extracted outcome measures used in the analyses **Child measures** HbA1c* Diabetes Self Management Profile (DSMP) Pediatric Quality of Life Inventory Diabetes Family Responsibility Questionnaire Diabetes Family Conflict Scale*
Notes	Funding: "This research was supported by the Intramural Research Program of the National Institutes of Health, *Eunice Kennedy Shriver* National Institute of Child Health and Human Development. The following institutions and investigators comprised the steering committee of the Family Management of Diabetes multi-site trial *Eunice Kennedy Shriver* National Institute of Child Health and Human Development, Bethesda, Maryland: Tonja R. Nansel, PhD, Bruce Simons-Morton, EdD, Ronald J. Iannotti Joslin Diabetes Center, Boston, Massachusetts: Lori Laffel, MD MPH, Korey Hood, PhD. Contract N01-HD-4-3364. Nemours Children's Clinic, Jacksonville, Florida: Tim Wysocki, PhD, Amanda Lochrie, PhD. Contract N01- HD-4-3361 Texas Children's Hospital, Houston, Texas: Barbara Anderson, PhD. Contract N01-HD-4-3362. Children's Memorial Hospital, Chicago, Illinois: Jill Weissberg-Benchell, PhD, Grayson Holmbeck, PhD. Contract N01-HD-4-3363 James Bell Associates, Arlington, Virginia; Cheryl McDonnell, PhD, MaryAnn D'Elio, Contract N01-HD-3-3360" COI: no conflict of interest statement included in the manuscript

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "30 to 32 families (total of 122) meeting the eligibility criteria were recruited and randomized into intervention or usual care groups." No method given Comment: method not described
Allocation concealment (selection bias)	Unclear risk	No description found in text Comment: probably not done
Blinding of outcome assessment (detection bias)	Low risk	Quote: "Except for biomedical data, which was obtained from medical records reviews and by interview during clinic visits, data collection occurred at home

Nansel 2009 *(Continued)*

All outcomes		visits at baseline and follow-up by trained interviewers not employed by the clinic." Comment: probably done
Incomplete outcome data (attrition bias) All outcomes	High risk	Attrition was not reported
Selective reporting (reporting bias)	Low risk	Outcomes data were fully reported

Nansel 2012

Study characteristics	
Methods	RCT. 2 arms. Assessed at pre-treatment, 24 months post-treatment
Participants	End of treatment n = 331 Start of treatment n = 390 Child sex: 192 M, 198 F Parent sex: not reported Child age (mean, SD): 12.5 ± 1.8 years Parent age: not reported Source: hospital Medical condition: type 1 diabetes Illness duration (mean): 4.9 years
Interventions	"WE*CAN intervention" "Usual Care Comparison" Mode of delivery: face-to-face + remote-telephone, family Intervention delivered by: health advisor Training: 2-day workshop including didactics, modelling, and practice, weekly conference calls, annual in-person training Duration of intervention (child, hours): 6 sessions + 18 phone calls Duration of intervention (parent, hours): 6 sessions + 18 phone calls
Outcomes	*Extracted outcome measures used in the analyses **Child measures** HbA1c* Diabetes Self-Management Profile Blood glucose meter data

Nansel 2012 *(Continued)*

Notes	Funding: "Supported by the intramural research program of the National Institutes of Health, Eunice Kennedy Shriver National Institute of Child Health and Human Development, under the following contracts: N01-HD-4-3364, Joslin Diabetes Center, Boston, Massachusetts; N01-HD-4-3361, Nemours Children's Clinic, Jacksonville, Florida; N01-HD-4-3362, Texas Children's Hospital, Houston, Texas; N01-HD-4-3363, Children's Memorial Hospital, Chicago, Illinois; and N01-HD-3-3360, James Bell Associates, Arlington, Virginia. Funded by the National Institutes of Health (NIH)" COI: "Financial Disclosure: The authors have indicated that they have no financial relationships relevant to this article to disclose."

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "A system of random permuted blocks within strata was prepared by the study coordinating center by a person not involved with data collection." Comment: probably done
Allocation concealment (selection bias)	Low risk	Quote: "A separate randomization list was prepared for each strata; lists were transferred to a sequence of sealed envelopes, each containing the assignment of intervention or usual care. Persons conducting assessments were blinded to study assignment." Comment: probably done
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "Persons conducting assessments were blinded to study assignment." Comment: probably done
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition was reported, there were no significant differences between completers and non-completers
Selective reporting (reporting bias)	High risk	Pre-specified outcomes identified in the Methods were not fully reported in the Results. The study authors provided these data on request

Palermo 2009

Study characteristics

Methods	RCT. 2 arms. Assessed at pre-treatment, post-treatment and 3-month follow-up
Participants	End of treatment n = 44 Start of treatment n = 48 Child sex: 13 M, 35 F Parent sex: 7 M, 41 F Child age (mean, SD): 14.8 ± 2.0 years Parent age: not reported Source: hospital Medical condition: chronic pain

Palermo 2009 *(Continued)*

	Illness duration (mean): 30 months
Interventions	"Web-based Management of Adolescent Pain (Web-MAP)" "Wait list control group" Mode of delivery: remote-internet, individual Intervention delivered by: internet + psychology postdoctoral fellow Training: 1 year of experience delivering face-to-face CBT to children with chronic pain Duration of intervention (child): 8 modules x 30 min = 4 h Duration of intervention (parent): 8 modules x 30 min = 4 h
Outcomes	*Extracted outcome measures used in the analyses **Child measures** Pain intensity (11-point numerical rating scale)* Child Activity Limitations Interview* Revised Child Anxiety and Depression Scale* **Parent measures** Adult Responses to Children's Symptoms*
Notes	Funding: "This research was supported by Grant HD050674 from the National Institutes of Health/National Institute of Child Health and Human Development (PI: Palermo) and by a grant from the Doernbecher Foundation" COI: "Conflict of interests: The present manuscript is submitted exclusively to Pain and is not under consideration in any other journal. There are no financial relationships that might lead to a conflict of interest."

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "A fixed allocation randomization scheme was used. Specifically, we used blocked randomization with blocks of 10 to assign participants to the two treatment conditions during the course of randomization. An online random number generator was used to produce the blocked randomization." Comment: probably done
Allocation concealment (selection bias)	Low risk	Quote: "Group assignments were identified by ID number in sealed envelopes. Following completion of all pre-treatment assessments, a research coordinator opened the sealed envelope to reveal the group assignment." Comment: probably done
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Participants completed questionnaires online
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition was reported, no significant differences between completers and non-completers were described

Palermo 2009 *(Continued)*

Selective reporting (reporting bias)	Low risk	Outcomes data were fully reported

Palermo 2016a

Study characteristics	
Methods	RCT. 2 arms. Assessed at pre-treatment, post-treatment, 3-month follow-up
Participants	End of treatment n = 60, 3-month follow-up n = 59 Start of treatment n = 61 Child sex: 12 M, 49 F Parent sex: 1 M, 60 F Child age (mean, SD) = 14.3 ± 1.9 years Parent age: not reported Source: hospital Medical condition: chronic pain Illness duration (mean): 2 years
Interventions	"Problem-Solving Skills Training" "Treatment as usual" Mode of delivery: face-to-face or remote-telephone, individual Intervention delivered by: psychology postdoctoral fellows, licensed clinical psychologists Training: didactic training, role play, weekly cross-site supervision with a licensed clinical psychologist Duration of intervention (child): none Duration of intervention (parent): 4-6 sessions x 1 h = 4-6 h
Outcomes	*Extracted outcome measures used in the analyses **Child measures** Pain intensity (11-point numerical rating scale)* Bath Adolescent Pain Questionnaire-Physical Functioning Subscale, Depression Subscale* **Parent measures** The Brief Symptom Inventory-18 Beck Depression Inventory-II* Profile of Mood States-Standard Bath Adolescent Pain-Parental Impact Questionnaire-Parent Behavior Subscale* Pain Catastrophizing Scale Short Form Health Survey 12

Palermo 2016a *(Continued)*

	Parenting Stress Index-Short Form Helping for Health Inventory Social Problem-Solving Skills Inventory-Revised
Notes	Funding: "Research reported in this publication was supported by the Eunice Kennedy Shriver National Institute of Child Health & Human Development of the National Institutes of Health under Award Number R21HD065180 (PI: T. M. P.)." COI: "Conflict of interest statement: None of the authors have any conflicts of interest."

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "A fixed allocation randomization scheme was used. The order of randomization to the 2 treatment conditions was generated separately for each site with an online program (randomizer.org). A blocked method design was used, with blocks of 4 for each identification number" Comment: probably done
Allocation concealment (selection bias)	Low risk	Quote: "Only the research coordinator had the password to the randomization table. Group assignment was concealed by formatting the document to block out group assignment until the time of randomization." Comment: probably done
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "All study assessments were self-report measures completed in participants' homes through mailings; children and parents were instructed to complete the measures independently." Comment: probably done
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition was fully reported and there were no differences between completers and non-completers
Selective reporting (reporting bias)	Low risk	Outcomes data were fully reported

Palermo 2016b

Study characteristics

Methods	RCT. 2 arms. Assessed at pre-treatment, post-treatment, 6-month follow-up
Participants	End of treatment n = 258, 6-month follow-up n = 257 Start of treatment n = 273 Child sex: 68 M, 205 F Parent sex: 16 M, 257 F Child age (mean, SD) = 14.7 ± 1.6 Parent age: not reported

Palermo 2016b *(Continued)*

	Source: hospital
	Medical condition: chronic pain
	Illness duration: not reported
Interventions	"Web-based Management of Adolescent Pain (Web-MAP)"
	"Internet Education"
	Mode of delivery: remote-internet, individual
	Intervention delivered by: internet + master's degree or psychology postdoctoral fellows
	Training: online coach manual + standard series training tasks (readings, role play, and supervision)
	Duration of intervention (child): 8 modules x 30 min = 4 h
	Duration of intervention (parent): 8 modules x 30 min = 4 h
Outcomes	*Extracted outcome measures used in the analyses
	Child measures
	Child Activity Limitations Interview*
	Pain Intensity (11-point numerical rating scale)*
	Bath Adolescent Pain Questionnaire-Depression Subscale*
	Adolescent Sleep Wake Scale
	Helping for Health Inventory
	Parent measures
	Adult Responses to Children's Symptoms*
	Helping for Health Inventory
	Bath Adolescent Pain-Parent Impact Questionnaire-Depression Subscale*
Notes	Funding: "Research reported in this study was supported by the Eunice Kennedy Shriver National Institute of Child Health & Human Development of the National Institutes of Health under Award Number R01HD062538 (T.M.P. [principal investigator])."
	COI: "Conflict of interest statement: None of the authors have any conflicts of interest."

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Randomization was implemented using a computer-generated randomization schedule to derive a randomization assignment to 2 treatment conditions in blocks of 4 for each ID number." Comment: probably done
Allocation concealment (selection bias)	Low risk	Quote: "The randomization assignment was programmed into the Web-MAP2 system. After pretreatment assessments, the group assignment was provided to each participant on the Web site with instructions on how to proceed during the treatment phase." Comment: probably done

Palermo 2016b *(Continued)*

Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "Assessments were completed online through our secure, password-protected Web site independently by adolescents and parents (using separate login procedures) at baseline before randomization, after completion of the 8 to 10 week intervention (immediately after treatment) and at 2 longer-term follow-up periods (6 and 12 months). Because all study assessments were completed independently online, there was no possible examiner bias in outcome assessments." Comment: probably done
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition was fully reported and study authors report that there were no differences between completers and non-completers
Selective reporting (reporting bias)	Low risk	Outcomes data were fully reported

Powers 2013

Study characteristics	
Methods	RCT. 2 arms. Assessed at pre-treatment, post-treatment (20 weeks), 3-month follow-up, 6-month follow-up, 9-month follow-up, 12-month follow-up
Participants	End of treatment n = 129, 3-month follow-up n = 129, 6-month follow-up n = 129, 9-month follow-up n = 129, 12-month follow-up n = 124 Start of treatment n = 135 Child sex: 28 M, 107 F Parent sex: 129 M, 131 F Child age (mean): 14.4 years Parent age: not reported Source: hospital Medical condition: chronic migraine Illness duration: not reported
Interventions	"Cognitive Behavioral Therapy + amitriptyline" "Education + amitriptyline" Mode of delivery: face-to-face, individual Intervention delivered by: postdoctoral psychology fellows Training: training and supervision by a licensed clinical psychologist with specialised experience in pain management Duration of intervention (child): 8 sessions x 1 h + 5 booster sessions Duration of intervention (parent): 3 sessions x 1 h + 5 booster sessions
Outcomes	*Extracted outcome measures used in the analyses

Powers 2013 *(Continued)*

	Child measures Headache frequency* Pediatric Migraine Disability Assessment Scale* Children's Depression Inventory*
Notes	Funding: "Funding was provided by grant R01NS05036 from the National Institute of Neurological Disorders and Stroke (Dr Powers), grant 8 UL1 TR000077 from the National Center for Research Resources and the National Center for Advancing Translational Sciences, and grant T32DK063929 from the National Institute of Diabetes and Digestive and Kidney Diseases for some of the postdoctoral fellows who contributed to the trial (Dr Powers, program director). Amitriptyline, which was provided without cost to participants, was purchased using National Institutes of Health grant funds and managed by the investigational pharmacy at Cincinnati Children's Hospital Medical Center." COI: "Conflict of interest disclosures: The authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none were reported."

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Block randomization (with varying block sizes of 4-10) was used, and participants were stratified by age. Randomization was computer generated and supplied via secure e-mail to the study therapist" Comment: probably done
Allocation concealment (selection bias)	Low risk	Quote: "Randomization was computer generated and supplied via secure e-mail to the study therapist." Comment: probably done
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "Outcome assessments were conducted by blinded study personnel." Comment: probably done
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Attrition was reported, however significant differences between completers and non-completers were not described
Selective reporting (reporting bias)	High risk	Pre-specified outcomes identified in the Methods were not fully reported in the Results. The authors provided these data on request

Robins 2005

Study characteristics	
Methods	RCT. 2 arms. Assessed pre-treatment, post-treatment and 6-12 months following study entry
Participants	End of treatment n = 69, 6-month follow-up = 69 Start of treatment n = 86 Child sex: 30 M, 39 F Parent sex: not reported Child age (mean, SD): 11.3 ± 2.4 years Parent age: not reported

Robins 2005 *(Continued)*

	Source: hospital, primary care
	Medical condition: recurrent abdominal pain
	Illness duration: not reported
Interventions	"Standard Medical Care plus Short-Term Cognitive-Behavioral Family Treatment"
	"Standard Medical Care"
	Mode of delivery: face-to-face, individual
	Intervention delivered by: psychology post-doctoral fellow or pre-doctoral intern
	Training: not reported
	Duration of intervention (child): 5 sessions x 40 mins = 3 h 20 mins
	Duration of intervention (parent): 3 sessions x 40 mins = 2 h
Outcomes	*Extracted outcome measures used in the analyses
	Child measures
	Abdominal Pain Index
	Child Somatization Inventory
	Functional Disability Inventory-Child Version
	School Absences obtained from school attendance records
	Parent measures
	Abdominal Pain Index
	Child Somatization Inventory
	Clinician measures
	Health service use obtained from physician offices
Notes	Funding: "This study was supported in part by a grant through the Nemours Research Programs, awarded to the first author"
	COI: no conflict of interest statement included in the manuscript

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "The remaining sample of 86 were randomly assigned using a coin-flip method." Comment: probably done
Allocation concealment (selection bias)	Unclear risk	No description found in text Comment: probably not done
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No description found in text Comment: probably not done

Robins 2005 *(Continued)*

Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Attrition was reported, but no data were presented on significant differences between completers and non-completers
Selective reporting (reporting bias)	High risk	Pre-specified outcomes identified in the Methods were not fully reported in the Results. The study authors did not provide these data when requested

Sahler 2002

Study characteristics	
Methods	RCT. 2 arms. Assessed pre-treatment, post-treatment and 3-month follow-up
Participants	End of treatment n = 81 Start of treatment n = 92 Child sex: not reported Parent sex: 0 M, 92 F Child age (mean, SD): 8.3 ± 5.5 years Parent age (mean, SD): 35.4 ± 6.6 years Source: hospital Medical condition: cancer Illness duration: 2-16 weeks
Interventions	"Problem solving therapy" "Standard psychosocial care" Mode of delivery: face-to-face + remote-telephone, individual Intervention delivered by: master's-level mental health professional or psychology graduate student Training: 3-day workshop, regular supervision Duration of intervention (child): 0 Duration of intervention (parent): 8 sessions x 1 h = 8 h
Outcomes	*Extracted outcome measures used in the analyses **Parent measures** Social Problem-Solving Inventory-Cancer* Profile of Mood States*
Notes	Funding: "This work was supported by Grant R25 CA 65520 from the National Cancer Institute, National Institutes of Health" COI: no conflict of interest statement included in the manuscript
Risk of bias	

Sahler 2002 *(Continued)*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Randomisation was performed centrally, after stratification by site, using a two-block technique that produced a unique sequence for each site, delivered as a set of consecutively numbered envelopes specifying each subject's assignment". Comment: probably done
Allocation concealment (selection bias)	Low risk	Quote: "Randomisation was performed centrally, after stratification by site, using a two-block technique that produced a unique sequence for each site, delivered as a set of consecutively numbered envelopes specifying each subject's assignment". Comment: probably done
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No description found in text Comment: probably not done
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Attrition was not adequately described to make a judgement
Selective reporting (reporting bias)	High risk	Pre-specified outcomes identified in the Methods were not fully reported in the Results. The study authors provided these data on request

Sahler 2005

Study characteristics	
Methods	RCT. 2 arms. Assessed pre-treatment, post-treatment and 6 months after baseline
Participants	End of treatment n = 407 Start of treatment n = 430 Child sex: 219 M, 210 F Parent sex: 0 M, 429 F Child age (mean): 7.6 years Parent age (mean): 35.5 years Source: hospital Medical condition: cancer Illness duration (range): 2-16 weeks
Interventions	"Bright IDEAS Problem Solving Skills Training" "Usual psychosocial care" Mode of delivery: face-to-face, individual Intervention delivered by: not reported Training: not reported

Sahler 2005 *(Continued)*

	Duration of intervention (child): 0 Duration of intervention (parent): 8 sessions x 1 h = 8 h
Outcomes	*Extracted outcome measures used in the analyses **Parent measures** Profile of Mood States Beck Depression Inventory-II* Social Problem-Solving Inventory-Revised* NEO-Five Factor Inventory Impact of Event Scale-Revised
Notes	Funding: "This project was supported by National Cancer Institute, National Institutes of Health Grant R25 CA65520" COI: no conflict of interest statement included in the manuscript

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Randomisation was performed centrally." Comment: method not described
Allocation concealment (selection bias)	Unclear risk	No description found in text Comment: probably not done
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No description found in text Comment: probably not done
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Attrition was reported, but no data were presented describing equivalence between completers and non-completers
Selective reporting (reporting bias)	High risk	Pre-specified outcomes identified in the Methods were not fully reported in the Results. The study authors provided these data on request

Sahler 2013

Study characteristics

Methods	RCT. 2 arms. Assessed pre-treatment, immediately following intervention post-treatment, 3-month follow-up
Participants	End of treatment n = 204 Start of treatment n = 309 Child sex: 165 M, 144 F Parent sex: 0 M, 309 F

Sahler 2013 *(Continued)*

	Child age (mean, SD): 8.8 ± 5.9 years Parent age (mean, SD): 37.3 ± 8.2 years Source: hospital Medical condition: cancer Illness duration (mean): 2.6 years
Interventions	"Bright IDEAS problem-solving skills training" "Nondirective support" Mode of delivery: face-to-face, individual Intervention delivered by: research assistants with graduate training in clinical or behavioral psychology Training: group training, weekly supervision Duration of intervention (child): 0 Duration of intervention (parent): 8 sessions x 1 h = 8 h
Outcomes	*Extracted outcome measures used in the analyses **Parent measures** Social Problem Solving Inventory-Revised* Profile of Mood States Total Mood Distubrance scale Beck Depression Inventory* Impact of Event Scale Revised
Notes	Funding: "Supported by Grant No. R01 CA098954" COI: "Authors' Disclosures of Potential Conflicts of Interest: The author(s) indicated no potential conflicts of interest."

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Participants completed baseline (T1) assessment and were randomly assigned to a treatment arm by using a block design of 6 stratified by site and language." Comment: probably done
Allocation concealment (selection bias)	Unclear risk	No description found in text Comment: probably not done
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "The reviewers were blinded to treatment condition." Comment: probably done
Incomplete outcome data (attrition bias)	Unclear risk	Attrition was reported, but no data were presented describing equivalence between completers and non-completers

Sahler 2013 *(Continued)*
All outcomes

Selective reporting (reporting bias)	Low risk	Outcomes data were fully reported

Sanders 1994

Study characteristics	
Methods	RCT. 2 arms. Assessed at pre-treatment, post-treatment, 6-month follow-up, 12-month follow-up
Participants	End of treatment n = 44 Start of treatment n = 44 Child sex: 16 M, 28 F Parent sex: not reported Child age (mean, SD): 9.2 ± 1.9 years Parent age (mean, SD): 39.3 ± 4.9 years Source: not reported Medical condition: recurrent abdominal pain Illness duration (mean): 44 months
Interventions	"Cognitive-behavioral family intervention" (CBT) "Standard pediatric care" Mode of delivery: face-to-face, individual Intervention delivered by: not reported Training: not reported Duration of intervention (child): 6 sessions x 50 mins = 5 h Duration of intervention (parent): 6 sessions x 50 mins = 5 h
Outcomes	*Extracted outcome measures used in the analyses **Child measures** Pain intensity* **Parent measures** Child Behavior Checklist-Internalizing* Parent observation of pain behaviors*
Notes	Funding: "This study was supported by Grant 53091 from the National Health and Medical Research Council of Australia to Matthew R. Sanders, Ross W. Shepherd, and Geoffrey Cleghorn" COI: no conflict of interest statement included in the manuscript
Risk of bias	

Sanders 1994 *(Continued)*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "The study used a randomized group comparison design with two treatment conditions." Comment: method not described
Allocation concealment (selection bias)	Unclear risk	No description found in text Comment: probably not done
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No description found in text Comment: probably not done
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Attrition was not adequately described to make a judgement
Selective reporting (reporting bias)	Low risk	Outcomes data were fully reported

Seid 2010

Study characteristics	
Methods	RCT. 3 arms. Assessed pre-treatment, post-treatment and 6-month follow-up
Participants	End of treatment n = 204, 6-month follow-up n = 188 Start of treatment n = 252 Child sex: 154 M, 98 F Parent sex: 9 M, 244 F Child age (mean, SD): 7.4 ± 3.1 years Parent age: not reported Source: primary care, community Medical condition: asthma Illness duration (mean): 44 months
Interventions	"Problem-Solving Skills Training + Care Coordination" "In Home Asthma Education + Care Coordination" "Standard care wait-list control" Mode of delivery: face-to-face, family Intervention delivered by: master's-level health educator, paraprofessional asthma home visitors (care co-ordination) Training: 2-week training including didactics, role play, observation Duration of intervention for "Problem Solving Skills Training + Care Coordination"

Seid 2010 *(Continued)*

	Parent = 6 sessions PSST x 60 min + 5 sessions Care Coordination x 60 min = 11 h Child = 6 sessions PSST x 60 min + 5 sessions Care Coordination x 60 min = 11 h
Outcomes	*Extracted outcome measures used in the analyses **Child measures** Pediatric Quality of Life Inventory Asthma Module Asthma Symptoms Scale* **Parent measures** Pediatric Quality of Life Inventory Health Service Use self report
Notes	Funding: "This research was supported by a grant from the Maternal and Child Health Bureau of the Health Resources and Services Administration (R40 MC01214/08044)" COI: "Conflict of Interest: Dr Varni holds the copyright and the trademark for the PedsQL and receives financial compensation from the Mapi Research Trust, which is a nonprofit research institute that charges distribution fees to for-profit companies that use the Pediatric Quality of Life Inventory"

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Blocked randomization, stratified by site of care and disease severity was used. Prepared randomization lists were created by the statistician and concealed until intervention assignment." Comment: probably done
Allocation concealment (selection bias)	Low risk	Quote: "Blocked randomization, stratified by site of care and disease severity was used. Prepared randomization lists were created by the statistician and concealed until intervention assignment." Comment: probably done
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "Bilingual, bicultural research staff, blinded to the intervention group, administered surveys in English or Spanish in participants' homes." Comment: probably done
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition was reported, there were no significant differences between completers and non-completers
Selective reporting (reporting bias)	Low risk	Data were fully reported

Stark 2005

Study characteristics	
Methods	RCT. 2 arms. Assessed pre-treatment, 8 weeks after baseline post-treatment
Participants	End of treatment n = 49

Stark 2005 *(Continued)*

	Start of treatment n = 65 Child sex: 9 M, 40 F Parent sex: not reported Child age (mean, SD): 6.5 ± 2.0 years Parent age (mean, SD): 36.1 ± 5.4 years Source: hospital Medical condition: juvenile rheumatoid arthritis Illness duration: not reported
Interventions	"Behavioral Intervention" "Enhanced Standard of Care" Mode of delivery: face-to-face, group Intervention delivered by: PHD psychologist for parents, post-doctoral fellow with help of a trained RA for children Training: treatment manual review, role play, weekly supervision Duration of intervention (child): 4 sessions x 90 min = 6 h Duration of intervention (parent): 4 sessions x 90 min = 6 h
Outcomes	*Extracted outcome measures used in the analyses **Parent measures** Weighed food diaries
Notes	Funding: "This research was supported by a Clinical Science Grant from the Arthritis Foundation, NIH/NIDDK Grant #DK59492 to Lori J. Stark, Ph.D., and by USPHS Grant #MO1 RR 08084 from the General Clinical Research Centers Program, National Center for Research Resources, NIH." COI: no conflict of interest statement included in the manuscript

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Participants were stratified on an estimate of their typical Ca intake at baseline across the two conditions....After stratification by estimated Ca intake classification, a block randomization protocol was utilized with a block size of two within each strata of Ca intake." Comment: probably done
Allocation concealment (selection bias)	Low risk	Quote: "The randomization sequence was generated and kept by personnel separate from the personnel conducting recruitment calls and the intervention." Comment: probably done
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "..the first two weekdays and the first weekend day, were analyzed by a registered dietician in the General Clinical Research Center (GCRC), who was unaware of the subject's treatment condition.."

Stark 2005 *(Continued)*

		Comment: probably done
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Attrition was reported, there were significant differences between completers and non-completers
Selective reporting (reporting bias)	Low risk	Outcomes data were fully reported

Stehl 2009

Study characteristics	
Methods	RCT. 2 arms. Assessed pre-treatment and 1 month post-treatment
Participants	End of treatment n = 48 Start of treatment n = 76 Child sex: 41 M, 35 F Parent sex: not reported Child age (mean): 6 years Parent age (mean): 36 years Source: hospital Medical condition: cancer Illness duration: not reported
Interventions	"Surviving Cancer Competently Intervention Program-Newly Diagnosed (SCCIP-ND)" "Standard Psychosocial Care" Mode of delivery: face-to-face + remote: CD-ROM + telephone, individual Intervention delivered by: psychology fellows, psychology intern, master's-level psychologist and doctoral-level nurse Training: 18 h of didactic and experiential training Duration of intervention (children) = 0 Duration of intervention (parents) = 3 sessions x 45 mins + 3 booster sessions = 4.5 h
Outcomes	*Extracted outcome measures used in the analyses **Parent measures** State Trait Anxiety Inventory* Impact of Event Scale-Revised Acute Stress Disorder Scale
Notes	Funding: "This research was supported by a grant from the National Cancer Institute (CA088828)" COI: "Conflict of interest: None declared"

Stehl 2009 *(Continued)*

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Randomization was completed by a predetermined concealed random assignment list maintained by a staff member unaware of patient identity." Comment: probably done
Allocation concealment (selection bias)	Low risk	Quote: "Randomization was completed by a predetermined concealed random assignment list maintained by a staff member unaware of patient identity." Comment: probably done
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "Add data collection took place at the hospital at a time and location of convenience for the family and was conducted by research assistants." Comment: probably done
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition was reported, there were no significant differences between completers and non-completers
Selective reporting (reporting bias)	Low risk	Outcomes data were fully reported

Tsitsi 2017

Study characteristics	
Methods	RCT. 2 arms. Assessed at pre-treatment and post-treatment (3 weeks)
Participants	End of treatment n = 54 Start of treatment n = 62 Child sex: not reported Parent sex: not reported Child age (mean, SD): 9.2 ± 4.9 years Parent age (mean, SD): 42.4 ± 6.4 years Source: hospital Medical condition: cancer Illness duration (mean): 4 weeks
Interventions	"Relaxation Cancer" "Standard Psychological Suport" Mode of delivery: remote-audio CD, individual Intervention delivered by: research assistant + digital media player

Tsitsi 2017 *(Continued)*

	Training: not reported Duration of intervention (child): none Duration of intervention (parent): 3 sessions x 25 min + 3 weeks of daily, self-guided sessions
Outcomes	*Extracted outcome measures used in the analyses **Parent measures** Blood pressure Heart rate Skin temperature Hamilton's Anxiety Scale* Profile of Mood States Brief Scale
Notes	Funding: not reported COI: "Conflict of interest: None declared."

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Randomization was performed by using a computer-generated sequence, concealed in sequentially numbered, sealed, opaque envelopes, (by an independent person) and kept by the research assistant." Comment: probably done
Allocation concealment (selection bias)	Low risk	Quote: "Randomization was performed by using a computer-generated sequence, concealed in sequentially numbered, sealed, opaque envelopes, (by an independent person) and kept by the research assistant." Comment: probably done
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No description found in text
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Attrition was reported, but no data were presented on equivalence between completers and non-completers
Selective reporting (reporting bias)	Low risk	Outcomes data were fully reported

Wade 2006a

Study characteristics

Methods	RCT. 2 arms. Assessed pre-treatment and at session 7 of 8
Participants	End of treatment n = 40 Start of treatment n = 46

Wade 2006a *(Continued)*

	Child sex: 23 M, 17 F Parent sex: not reported Child age (mean, SD): 11.0 ± 3.3 years Parent age: not reported Source: hospital Medical condition: TBI Illness duration (mean): 13.7 months
Interventions	"Family Problem Solving" (PST) "Internet Resources Control" Mode of delivery: remote-internet + teleconference, family Intervention delivered by: internet + clinical psychology graduate student Training: 2-month training, treatment manual, weekly supervision Duration of intervention (children): 8 core modules, 6 supplementary modules Duration of intervention (parents): 8 core modules, 6 supplementary modules
Outcomes	*Extracted outcome measures used in the analyses **Parent outcomes** Child Behavior Checklist-Total Score* Social Problem-Solving Index* Symptom Checklist-90-Revised Global Severity Index Center for Epidemiologic Studies Depression Scale* Anxiety Inventory
Notes	Funding: "This work was supported by National Council on Medical Rehabilitation Research, National Institutes of Health Grant HD40942". COI: no conflict of interest statement included in the manuscript

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Families were randomly assigned to family problem-solving or Internet resources comparison via a computer programme." Comment: probably done
Allocation concealment (selection bias)	Unclear risk	No description found in text Comment: probably not done
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "Given the nature of the study, neither the participants nor the research assistant was blind to group assignment. The primary outcome measures were based on parent and child report and therefore not dependent on the judgments of the research staff. " Comment: probably done
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Attrition was not reported, there were no significant differences between completers and non-completers
Selective reporting (reporting bias)	High risk	Pre-specified outcomes identified in the Methods were not fully reported in the Results. The study authors provided these data on request

Wade 2014

Study characteristics	
Methods	RCT. 2 arms. Assessed pre-treatment, post-treatment (6 months) 12-month follow-up, 18-month follow-up
Participants	End of treatment n = 127, 12-month follow-up n = 112, 18-month follow-up n = 84 Start of treatment n = 132 Child sex: not reported Parent sex: not reported Child age (range): 12-17 years Parent age: not reported Source: hospital Medical condition: TBI Illness duration: not reported
Interventions	"Counselor-Assisted Problem Solving " "Internet Resources Comparison" Mode of delivery: remote-internet + videoconference, family Intervention delivered by: internet + clinical psychologists Training: not reported Duration of intervention (child): 8 modules, 6 video conferences/max of 4 supplemental family sessions Duration of intervention (parent): 8 modules, 6 video conferences/max of 4 supplemental family sessions
Outcomes	*Extracted outcome measures used in the analyses **Parent measures** Caregiver Self-Efficacy Scale* Center for Epidemiologic Studies Depression Scale* Child and Adolescent Functional Assessment Scale* Child Behavior Checklist* Family Assessment Device* Iowa Family Interaction Rating Scale Problem Solving Discussion Rating Scale Symptom Checklist-90
Notes	Funding: "This work was supported in part by 1) NIH grant R01-MH073764 from the National Institute of Mental Health; and 2) a grant from the Colorado Traumatic Brain Injury Trust Fund Research Program, Colorado Department of Human Services, Division of Vocational Rehabilitation, Traumatic Brain Injury Program."

Wade 2014 *(Continued)*

	COI: "We certify that no party having a direct interest in the results of the research supporting this article has or will confer a benefit on us or on any organization with which we are associated."

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "A SAS program was created using permuted block sizes for each randomization." Comment: probably done
Allocation concealment (selection bias)	Low risk	Quote: "Group assignment was contained in a sealed envelope that was handed to the participants at the end of the baseline visit." Comment: probably done
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "Group assignment was contained in a sealed envelope that was handed to the participants at the end of the baseline visit. In this fashion, group assignment was concealed from the research coordinators completing the baseline and follow-up assessments." Comment: probably done
Incomplete outcome data (attrition bias) All outcomes	Low risk	Attrition was reported, there were no significant differences between completers and non-completers
Selective reporting (reporting bias)	High risk	Pre-specified outcomes identified in the Methods were not fully reported in the Results. The study authors provided these data on request

Wade 2017

Study characteristics

Methods	RCT. 3 arms. Assessed baseline, post-treatment, and 6-month follow-up
Participants	End of treatment n = 95, 6-month follow-up n = 79 Start of treatment n = 117, Child sex: 69 M, 44F Sex of parents: unknown Child age (mean, SD): 5.4 ± 2.2 years Parent age: not reported Source: hospital Medical condition: TBI Illness duration (mean): 10.8 months
Interventions	"I-InTERACT Program" "I-InTERACT Express" "Internet resource group"

Wade 2017 *(Continued)*

	Mode of delivery: remote-internet + teleconference, individual Intervention delivered by: licensed psychologists, postdoctoral fellow, advanced clinical psychology graduate students Training: treatment manual + 3-day training, weekly supervision and fidelity checklists Duration of intervention (parent + child) I-InTERACT Program = 10 core modules + 4 optional plus weekly videoconferencing Duration of intervention (parent + child) I-InTERACT Express = 7 core modules plus weekly videoconferencing
Outcomes	*Extracted outcome measures used in the analyses **Child & Parent measures** Dyadic Parent-Child Interaction Coding Scheme* Eyeberg Child Behavior Inventory (child only)*
Notes	Funding "This study was funded by the National Institute on Disability, Independent Living, and Rehabilitation Research, formerly known as the National Institute on Disability and Rehabilitation Research (grant H133b090010)." COIs: "Drs. Wade, Cassedy, Zhang, Kirkwood, Stancin, Yeates, Taylor, Ms. Shultz and Mr. Zhang report no biomedical financial interests or potential conflicts of interest"

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Families were randomized to 1 of 3 groups (I-InTERACT; Express, an abbreviated web-based parent skills training; or IRC) using a SAS-generated randomization scheme (SAS Institute, Cary, NC)."
Allocation concealment (selection bias)	Low risk	Research assistant informed families of treatment allocation
Blinding of outcome assessment (detection bias) All outcomes	High risk	Quote: "Group assignment was concealed to coders of parenting skills videos, but not from coordinators, therapists, or participants." Comment: coordinators who administered outcome assessments were not blind to group assignment
Incomplete outcome data (attrition bias) All outcomes	High risk	Attrition reported. Differences identified between completers and non-completers
Selective reporting (reporting bias)	High risk	Pre-specified outcomes identified in the Methods were not fully reported in the Results. The authors provided these data on request

Westrupp 2015

Study characteristics

Methods	RCT. 2 arms. Assessed pre-treatment, post-treatment (3 months), 6-month follow-up, 12-month follow-up, 24-month follow-up

Westrupp 2015 *(Continued)*

Participants	End of treatment n = 60, 6-month follow-up n = 44, 12-month follow-up = 57 Start of treatment n = 83 Child sex: 43 M, 33 F Parent sex: not reported Child age (mean, SD): 9.0 ± 2.4 years Parent age: not reported Source: hospital Medical condition: type 1 diabetes Illness duration: 3.5 years
Interventions	"Triple P" "Standard Care" Mode of delivery: face-to-face, individual Intervention delivered by: clinical psychologist Training: not reported Duration of intervention (child): none Duration of intervention (parent): 10 sessions x 1 h = 10 h
Outcomes	*Extracted outcome measures used in the analyses **Child measures** HbA1c* **Parent measures** Behavior Assessment System for Children, 2nd Edition* Depression Anxiety Stress Scale* Parenting Scale* Parenting Sense of Competency Scale Parent Problem Checklist Eyberg Child Behavior Inventory Diabetes Family Conflict Scale Revised* Relationship Quality Index
Notes	Funding: "This study was funded by 3 grants from Eli Lilly, and the Early Development and Disease, and Critical Care and Neurosciences Departments at the Murdoch Childrens Research Institute (MCRI). Research at MCRI is supported by the Victorian Government's Operational Infrastructure Support Program." COI: "The authors have no other conflicts of interest to declare."
Risk of bias	

Westrupp 2015 *(Continued)*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Eligible families were randomized sequentially to Triple P or SDC using pre prepared cards (stratified by pre-existing child internalizing or externalizing behavior problems) stored in opaque envelopes generated by an independent statistician." Comment: method of randomization is not clear
Allocation concealment (selection bias)	Low risk	Quote: "Eligible families were randomized sequentially to Triple P or SDC using pre prepared cards (stratified by pre-existing child internalizing or externalizing behavior problems) stored in opaque envelopes generated by an independent statistician." Comment: probably done
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No description found in text
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Attrition was reported. Significant differences between participants who started intervention vs. participants who dropped out after randomization are reported, but differences between remaining completers and non-completers not reported
Selective reporting (reporting bias)	High risk	Pre-specified outcomes identified in the Methods were not fully reported in the Results. The study authors provided these data on request

Wysocki 1999

Study characteristics	
Methods	RCT. 3 arms. Assessed pre-treatment, 3 months (post-treatment), 6-month follow-up and 12-month follow-up
Participants	End of treatment n = 115, 6-month follow-up n = 113, 12-month follow-up n = 108 Start of treatment n = 119 children Child sex: 50 M, 69 F Parent sex: 82 M, 117 F Child age (mean, SD): 14.3 ± 1.4 years Parent age: not reported Source: hospital Medical condition: type 1 diabetes Illness duration (mean): 5.0 years
Interventions	"Behavioral Family Systems Therapy (BFST)" "Education and Support Group" "Standard Care"

Wysocki 1999 *(Continued)*

	Mode of delivery: face-to-face, family
	Intervention delivered by: clinical psychologist
	Training: 150 h
	Duration of intervention (child): 10 sessions, time not reported
	Duration of intervention (parents): 10 sessions, time not reported
Outcomes	*Extracted outcome measures used in the analyses
	Child measures
	Parent-Adolescent Relationship Questionnaire*
	Issues Checklist
	24 Hour Recall Interview of Conflict Situations
	Teen Adjustment to Diabetes Scale*
	Diabetes Responsibility and Conflict
	24 Hour Recall Interview of IDDM Self-Care
	Self-Care Inventory
	Glycated hemoglobin*
	Parent measures
	Parent-Adolescent Relationship Questionnaire*
	Issues Checklist
	24 Hour Recall Interview of Conflict Situations
	Teen Adjustment to Diabetes Scale
	Diabetes Responsibility and Conflict
	24 Hour Recall Interview of IDDM Self-Care
	Self-Care Inventory
	Parent-reported health service use
Notes	Funding: "This work was supported by grant 1-RO1-DK43802 “Behavior Therapy for Families of Diabetic Adolescents” awarded by the National Institutes of Health to the first author and by the Pediatric and General Clinical Research Centers of Washington University (RR6021 and RR00036)"
	COI: no conflict of interest statement included in the manuscript

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "The research scientist at the opposing centre randomly assigned each family, without knowledge of the family's baseline status on any of the outcome measures to one of three conditions." Comment: method not fully described

Wysocki 1999 *(Continued)*

Allocation concealment (selection bias)	Unclear risk	No description found in text
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Quote: "A research assistant administered questionnaires at evaluation sessions; the research assistant completed telephone interviews during the two weeks preceding each of the four evaluations." Comment: blinding not described
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Attrition was reported, but no data were presented on equivalence between completers and non-completers
Selective reporting (reporting bias)	High risk	Pre-specified outcomes identified in the Methods were not fully reported in the Results. The study authors did not provide these data on request

Wysocki 2006

Study characteristics	
Methods	RCT. 3 arms. Assessed at pre-treatment, 6 months (post-treatment), 12-month follow-up, 18-month follow-up
Participants	End of treatment n = 92, 12-month follow-up n = 88, 18-month follow-up n = 85 Start of treatment n = 104 Child sex: 57 M, 47 F Sex of parents: not reported Child age (mean, SD): 14.2 ± 1.9 years Parent age: not reported Source: hospital Medical condition: type 1 diabetes or insulin-treated type 2 diabetes Illness duration (mean): 5.5 years
Interventions	"Behavioral Family Systems Therapy for Diabetes (BFST-D)" "Educational Support Group" "Standard Care" Mode of delivery: face-to-face, family Intervention delivered by: clinical psychologist, clinical social worker Training: not reported Duration of intervention (child): 12 sessions over 6 months Duration of intervention (parent): 12 sessions over 6 months
Outcomes	*Extracted outcome measures used in the analyses **Child measures**

Wysocki 2006 *(Continued)*

	Parent-Adolescent Relationship Questionnaire*
	HbA1c*
	Diabetes Responsibility and Conflict
	Diabetes Self-Management Profile
	Family problem-solving discussions coded using Interaction Behavior Code
	Parent measures
	Parent-Adolescent Relationship Questionnaire*
	Diabetes Responsibility and Conflict
	Diabetes Self-Management Profile
	Family problem-solving discussions coded using Interaction Behavior Code
Notes	Funding: "this study was supported by NIH grants 1 RO1-DK43802 and K24 DK67128 to the first author; and NIH grants P60 DK20579 and RR00036 which support the Diabetes Research and Training Center and General Clinical Research Center, respectively, at the Washington University School of Medicine"
	COI: no conflict of interest statement included in the manuscript

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "A three-group, randomized treatments design was used." Comment: method not described fully
Allocation concealment (selection bias)	Unclear risk	Quote: "Families were stratified by HbA1c". Comment: no description of concealment described
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Quote: "Raters were unaware of the family's identity or group assignment or of when the recording was made." Comment: probably done
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Attrition was reported, but no data were presented on equivalence between completers and non-completers
Selective reporting (reporting bias)	High risk	Pre-specified outcomes identified in the Methods were not fully reported in the Results. The study authors did not provide these data on request

Yeh 2016

Study characteristics

Methods	RCT. 2 arms. Assessed pre-treatment, post-treatment (3 months), 12-month follow-up
Participants	End of treatment n = 66, 12-month follow-up n = 65 Start of treatment n = 76

Yeh 2016 *(Continued)*

	Child sex: 39 M, 26 F
	Parent sex: 9 M, 53 F
	Child age: not reported
	Parent age: not reported
	Source: hospital
	Medical condition: asthma
	Illness duration: not reported
Interventions	"Asthma Family Empowerment Program Asthma"
	"Self management"
	Mode of delivery: face-to-face, family
	Intervention delivered by: first study author (discipline not specified)
	Training: not reported
	Duration of intervention (child): 4 sessions x 50 min = 3 h 20 mins
	Duration of intervention (parent): 4 sessions x 50 min = 3 h 20 mins
Outcomes	*Extracted outcome measures used in the analyses
	Child measures
	FEV1*
	Peak expiratory flow
	Asthma symptoms
	Parent measures
	Parental Stress Index*
	Family Environment Scale*
Notes	Funding: "this is supported by grants from the National Science Council (no. NSC97-2314-B-039-034-MY3)."
	COI: "this is a follow-up evaluation study conducted by the researcher without conflict of interest."

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "The eligible families were randomly assigned to one of two groups using sealed opaque envelopes, following computer-generated random serial numbers by the correspondent author (principal investigator)." Comment: probably done
Allocation concealment (selection bias)	Unclear risk	Quote: "The eligible families were randomly assigned to one of two groups using sealed opaque envelopes, following computer-generated random serial numbers by the correspondent author (principal investigator)."

Yeh 2016 *(Continued)*

		Comment: probably done, however the principal investigator was the therapist delivering treatment
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No description found in text
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Attrition was reported, but no data were presented on equivalence between completers and non-completers
Selective reporting (reporting bias)	Low risk	Outcomes data were fully reported

CBT: cognitive-behavioural therapy; **CHW:** community health worker; **COI:** conflict of interest; **GI:** gastrointestinal; **IBD:** inflammatory bowel disease; **IBS:** irritable bowel syndrome; **IDDM:** insulin-dependent diabetes mellitus; **MST:** multisystemic therapy; **n:** number; **PSST:** problem-solving skills training; **PST:** problem-solving therapy; **RA:** research assistant; **RCT:** randomized controlled trial; **SD:** standard deviation; **TBI:** traumatic brain injury
Note: some demographic information such as the sex of participants may not match the number of participants randomized. We have extracted and reported data from studies, however, some studies have missing demographic data.

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Aleman 1992	Insufficient psychotherapeutic content
Allen 1998	Inadequate n: the number of participants in any treatment arm was < 20
Anderson 1999	Insufficient psychotherapeutic content
Antonini 2014	Inadequate n: the number of participants in any treatment arm was < 20
Barakat 2010	Inadequate n: the number of participants in any treatment arm was < 20
Barrera 2018a	Insufficient psychotherapeutic content delivered to parents
Barrera 2018b	Insufficient psychotherapeutic content
Barry 1997	Inadequate n: the number of participants in any treatment arm was < 20
Bellin 2013	Insufficient psychotherapeutic content
Betancourt 2004	Identified participants prospectively
Borhani 2011	Aim of study was irrelevant to this review
Braga 2005	Insufficient psychotherapeutic content
Brown 2014	Mixed conditions; data not reported separately for the purpose of this review
Bruzzese 2008	Aim of study was irrelevant to this review
Burke 1997	Insufficient psychotherapeutic content
Burke 2001	Insufficient psychotherapeutic content

Study	Reason for exclusion
Cakan 2007	Aim of study was irrelevant to this review
Canino 2008	Aim of study was irrelevant to this review
Canino 2016	Insufficient psychotherapeutic content
Carey 2008	Aim of study was irrelevant to this review
Celano 2012	Inadequate n: the number of participants in any treatment arm was < 20
Cernvall 2015	Inadequate n: the number of participants in any treatment arm was < 20
Chen 2013	Insufficient psychotherapeutic content
Chernoff 2002	Insufficient psychotherapeutic content
Chiang 2009	Insufficient psychotherapeutic content
Christie 2016	Insufficient psychotherapeutic content
Churchill 2018	Mixed illness conditions
Connelly 2006	Inadequate n: the number of participants in any treatment arm was < 20
Duarte 2006	Inadequate n: the number of participants in any treatment arm was < 20
Ellis 2004	Inadequate n: the number of participants in any treatment arm was < 20
Ellis 2007	Aim of study was irrelevant to this review
Ellis 2008	Aim of study was irrelevant to this review
Evans 1999	Insufficient psychotherapeutic content
Fedele 2013	Aim of study was irrelevant to this review
Field 1998	Insufficient psychotherapeutic content
Forsander 1995	Aim of study was irrelevant to this review
Forsander 2003	Inadequate n: the number of participants in any treatment arm was < 20
Garbutt 2010	Insufficient psychotherapeutic content
Gerber 2010	Aim of study was irrelevant to this review
Giallo 2008	Insufficient psychotherapeutic content
Glang 2007	Insufficient psychotherapeutic content
Grey 2011	Replicated data already included in the review
Groß 2013	Insufficient psychotherapeutic content
Gulewitsch 2012	Aim of study was irrelevant to this review

Study	Reason for exclusion
Gulewitsch 2013	Inadequate n: the number of participants in any treatment arm was < 20
Gustafsson 1986	Inadequate n: the number of participants in any treatment arm was < 20
Halterman 2014	Insufficient psychotherapeutic content
Harris 2001	Aim of study was irrelevant to this review
Haus 1976	Inadequate n: the number of participants in any treatment arm was < 20
Hernandez 1998	Inadequate n: the number of participants in any treatment arm was < 20
Hicks 2006	Inadequate n: the number of participants in any treatment arm was < 20
Hommel 2012	Aim of study was irrelevant to this review
Hovell 1994	Insufficient psychotherapeutic content
Humphreys 2000	Insufficient psychotherapeutic content
Ireys 1996	Insufficient psychotherapeutic content
Ireys 2001	Insufficient psychotherapeutic content
Jay 1990	Aim of study was irrelevant to this review
Johnson 1987	Insufficient psychotherapeutic content
Kamps 2008	Inadequate n: the number of participants in any treatment arm was < 20
Kashikar-Zuck 2005	Inadequate n: the number of participants in any treatment arm was < 20
Kaslow 2000	Insufficient psychotherapeutic content
Katz 2014	Insufficient psychotherapeutic content
Kazak 1996	Insufficient psychotherapeutic content
Kazak 2005	Inadequate n: the number of participants in any treatment arm was < 20
Ketchen 2006	Insufficient psychotherapeutic content
Klinnert 2005	Insufficient psychotherapeutic content
Klinnert 2007	Insufficient psychotherapeutic content
Kroner-Herwig 1998	Inadequate n: the number of participants in any treatment arm was < 20
Kupfer 2010	Insufficient psychotherapeutic content
Kurowski 2013	Aim of study was irrelevant to this review
Lasecki 2008	Inadequate n: the number of participants in any treatment arm was < 20
Lask 1979	Inadequate n: the number of participants in any treatment arm was < 20

Study	Reason for exclusion
Lehmkuhl 2010	Inadequate n: the number of participants in any treatment arm was < 20
Logan 1997	Insufficient psychotherapeutic content
Lyon 2013	Aim of study was irrelevant to this review
Manne 2016	Mixed conditions; data not reported separately for the purpose of this review
Marsland 2013	insufficient n
Mendez 1997	Insufficient psychotherapeutic content
Mortenson 2016	Insufficient psychotherapeutic content
Mowla 2017	Mixed illness conditions
Mullins 2012	n < 20 at post-treatment
Murphy 2012	Insufficient psychotherapeutic content
Nelson 2011	Insufficient psychotherapeutic content
Ng 2008	Inadequate n: the number of participants in any treatment arm was < 20
Niebel 2000	n < 20 at post-treatment
Olivares 1997	Inadequate n: the number of participants in any treatment arm was < 20
Pérez 1999	Insufficient psychotherapeutic content
Rapoff 2014	Insufficient psychotherapeutic content delivered to parents
Rasoli 2008	Aim of study was irrelevant to this review
Rice 2015	Insufficient psychotherapeutic content
Sanders 1989	Inadequate n: the number of participants in any treatment arm was < 20
Sanders 1996	Inadequate n: the number of participants in any treatment arm was < 20
Saßman 2012	Inadequate n: the number of participants in any treatment arm was < 20
Satin 1989	Inadequate n: the number of participants in any treatment arm was < 20
Scholten 2011	Aim of study was irrelevant to this review
Scholten 2015	Mixed conditions; data not reported separately for the purpose of this review
Shekarabi-Ahari 2012	insufficient n
Sieberg 2011	Inadequate n: the number of participants in any treatment arm was < 20
Staab 2002	Insufficient psychotherapeutic content
Sullivan-Bolyai 2010	Insufficient psychotherapeutic content

Study	Reason for exclusion
Sullivan-Bolyai 2015	Insufficient psychotherapeutic content
Szczepanski 2010	Insufficient psychotherapeutic content
Szigethy 2014	Insufficient psychotherapeutic content
Tsiouli 2014	n < 20 at post-treatment
Van der Veek 2013	Aim of study was irrelevant to this review
Van Dijk-Lokkart 2016	Insufficient psychotherapeutic content
Wade 2006b	n < 20 at post-treatment
Wade 2010	Aim of study was irrelevant to this review
Wade 2011	Inadequate n: the number of participants in any treatment arm was < 20
Walders 2006	Insufficient psychotherapeutic content
Walker 1996	Aim of study was irrelevant to this review
Warner 2011	Inadequate n: the number of participants in any treatment arm was < 20
Wysocki 1997	Aim of study was irrelevant to this review

n: number

DATA AND ANALYSES

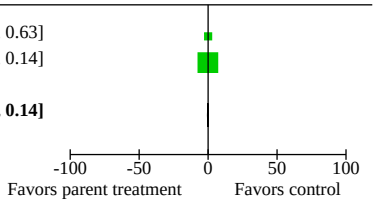
Comparison 1. Asthma post-treatment

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1.1 Parenting behavior	2	209	Std. Mean Difference (IV, Random, 95% CI)	-0.13 [-0.40, 0.14]
1.2 Parent mental health	1	65	Std. Mean Difference (IV, Random, 95% CI)	-0.76 [-1.27, -0.26]
1.3 Child mental health	1	41	Std. Mean Difference (IV, Random, 95% CI)	-0.04 [-0.66, 0.57]
1.4 Child symptoms	3	337	Std. Mean Difference (IV, Random, 95% CI)	-0.16 [-0.63, 0.31]
1.5 Family functioning	2	107	Std. Mean Difference (IV, Random, 95% CI)	-0.32 [-1.49, 0.86]

Analysis 1.1. Comparison 1: Asthma post-treatment, Outcome 1: Parenting behavior

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Morawska 2016	-136.7	33.64	20	-137.3	20.13	22	20.1%	0.02 [-0.58 , 0.63]
Naar-King 2014	-7.91	1.6	84	-7.61	1.96	83	79.9%	-0.17 [-0.47 , 0.14]
Total (95% CI)			**104**			**105**	**100.0%**	**-0.13 [-0.40 , 0.14]**

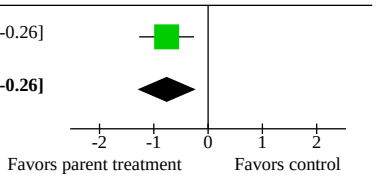
Heterogeneity: Tau² = 0.00; Chi² = 0.30, df = 1 (P = 0.59); I² = 0%
Test for overall effect: Z = 0.93 (P = 0.35)
Test for subgroup differences: Not applicable



Analysis 1.2. Comparison 1: Asthma post-treatment, Outcome 2: Parent mental health

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Yeh 2016	202.12	25.93	34	222.03	25.57	31	100.0%	-0.76 [-1.27 , -0.26]
Total (95% CI)			**34**			**31**	**100.0%**	**-0.76 [-1.27 , -0.26]**

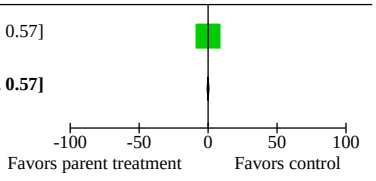
Heterogeneity: Not applicable
Test for overall effect: Z = 2.96 (P = 0.003)
Test for subgroup differences: Not applicable



Analysis 1.3. Comparison 1: Asthma post-treatment, Outcome 3: Child mental health

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Morawska 2016	47.3	28.3	20	48.5	24.64	21	100.0%	-0.04 [-0.66 , 0.57]
Total (95% CI)			**20**			**21**	**100.0%**	**-0.04 [-0.66 , 0.57]**

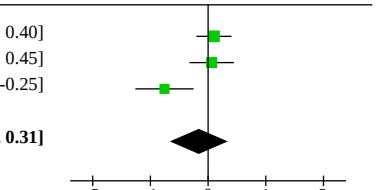
Heterogeneity: Not applicable
Test for overall effect: Z = 0.14 (P = 0.89)
Test for subgroup differences: Not applicable



Analysis 1.4. Comparison 1: Asthma post-treatment, Outcome 4: Child symptoms

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Naar-King 2014	-2.24	0.6	84	-2.3	0.58	83	37.0%	0.10 [-0.20 , 0.40]
Seid 2010	-74.4	18.3	47	-75.5	16.9	58	33.9%	0.06 [-0.32 , 0.45]
Yeh 2016	-1.47	0.46	34	-1.17	0.3	31	29.1%	-0.76 [-1.26 , -0.25]
Total (95% CI)			**165**			**172**	**100.0%**	**-0.16 [-0.63 , 0.31]**

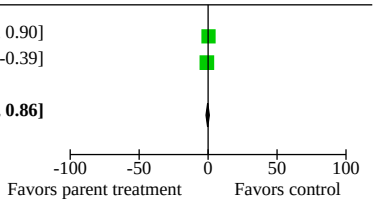
Heterogeneity: Tau² = 0.13; Chi² = 8.77, df = 2 (P = 0.01); I² = 77%
Test for overall effect: Z = 0.67 (P = 0.50)
Test for subgroup differences: Not applicable



Analysis 1.5. Comparison 1: Asthma post-treatment, Outcome 5: Family functioning

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Morawska 2016	-61.56	36.01	20	-70.45	22.22	22	49.0%	0.29 [-0.31 , 0.90]
Yeh 2016	-49.44	3.14	34	-44.68	6.79	31	51.0%	-0.90 [-1.42 , -0.39]
Total (95% CI)			**54**			**53**	**100.0%**	**-0.32 [-1.49 , 0.86]**

Heterogeneity: Tau² = 0.64; Chi² = 8.70, df = 1 (P = 0.003); I² = 89%
Test for overall effect: Z = 0.53 (P = 0.60)
Test for subgroup differences: Not applicable



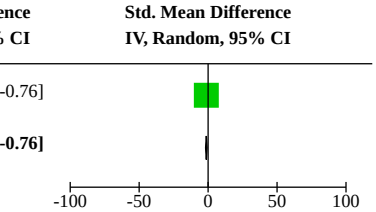
Comparison 2. Asthma follow-up

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
2.1 Parent mental health	1	65	Std. Mean Difference (IV, Random, 95% CI)	-1.30 [-1.83, -0.76]
2.2 Child symptoms	2	160	Std. Mean Difference (IV, Random, 95% CI)	-0.32 [-1.25, 0.62]
2.3 Family functioning	1	65	Std. Mean Difference (IV, Random, 95% CI)	-2.71 [-3.39, -2.02]

Analysis 2.1. Comparison 2: Asthma follow-up, Outcome 1: Parent mental health

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Yeh 2016	195.32	25.68	34	228.68	25.17	31	100.0%	-1.30 [-1.83 , -0.76]
Total (95% CI)			**34**			**31**	**100.0%**	**-1.30 [-1.83 , -0.76]**

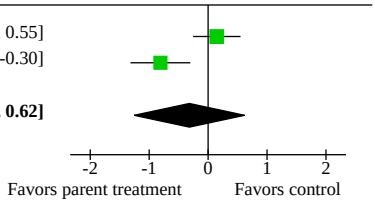
Heterogeneity: Not applicable
Test for overall effect: Z = 4.72 (P < 0.00001)
Test for subgroup differences: Not applicable



Analysis 2.2. Comparison 2: Asthma follow-up, Outcome 2: Child symptoms

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Seid 2010	-76.2	21.6	46	-79.2	18.8	49	51.4%	0.15 [-0.26 , 0.55]
Yeh 2016	-1.49	0.43	34	-1.19	0.28	31	48.6%	-0.81 [-1.32 , -0.30]
Total (95% CI)			**80**			**80**	**100.0%**	**-0.32 [-1.25 , 0.62]**

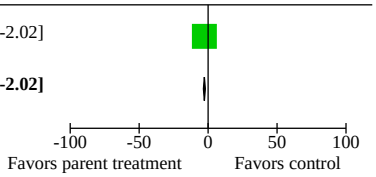
Heterogeneity: Tau² = 0.40; Chi² = 8.37, df = 1 (P = 0.004); I² = 88%
Test for overall effect: Z = 0.67 (P = 0.51)
Test for subgroup differences: Not applicable



Analysis 2.3. Comparison 2: Asthma follow-up, Outcome 3: Family functioning

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Yeh 2016	-56.38	3.28	34	-43.32	5.99	31	100.0%	-2.71 [-3.39 , -2.02]
Total (95% CI)			**34**			**31**	**100.0%**	**-2.71 [-3.39 , -2.02]**

Heterogeneity: Not applicable
Test for overall effect: Z = 7.76 (P < 0.00001)
Test for subgroup differences: Not applicable



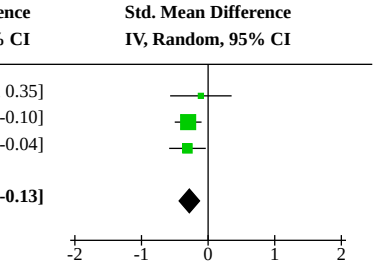
Comparison 3. Cancer post-treatment

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
3.1 Parenting behavior	3	664	Std. Mean Difference (IV, Random, 95% CI)	-0.28 [-0.43, -0.13]
3.2 Parent mental health	6	836	Std. Mean Difference (IV, Random, 95% CI)	-0.21 [-0.35, -0.08]

Analysis 3.1. Comparison 3: Cancer post-treatment, Outcome 1: Parenting behavior

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Sahler 2002	-72.85	14.48	33	-71.32	13.49	40	11.0%	-0.11 [-0.57 , 0.35]
Sahler 2005	-14.33	2.54	189	-13.59	2.39	195	57.9%	-0.30 [-0.50 , -0.10]
Sahler 2013	-14.58	2.61	97	-13.74	2.78	110	31.1%	-0.31 [-0.58 , -0.04]
Total (95% CI)			**319**			**345**	**100.0%**	**-0.28 [-0.43 , -0.13]**

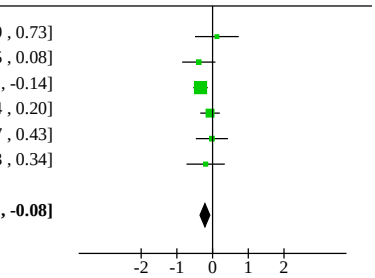
Heterogeneity: Tau² = 0.00; Chi² = 0.61, df = 2 (P = 0.74); I² = 0%
Test for overall effect: Z = 3.61 (P = 0.0003)
Test for subgroup differences: Not applicable



Analysis 3.2. Comparison 3: Cancer post-treatment, Outcome 2: Parent mental health

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Hoekstra-Weebers 1998	46.9	10.7	20	45.4	13.5	21	4.9%	0.12 [-0.49 , 0.73]
Sahler 2002	80.76	38.81	33	98.1	48.5	40	8.6%	-0.39 [-0.85 , 0.08]
Sahler 2005	10.74	8.8	191	13.87	9.66	194	45.9%	-0.34 [-0.54 , -0.14]
Sahler 2013	12.14	10.4	97	12.86	9.66	110	24.9%	-0.07 [-0.34 , 0.20]
Stehl 2009	42.05	15.54	38	42.35	15.22	38	9.2%	-0.02 [-0.47 , 0.43]
Tsitsi 2017	11.7	8.15	29	13.33	8.38	25	6.5%	-0.19 [-0.73 , 0.34]
Total (95% CI)			**408**			**428**	**100.0%**	**-0.21 [-0.35 , -0.08]**

Heterogeneity: Tau² = 0.00; Chi² = 4.90, df = 5 (P = 0.43); I² = 0%
Test for overall effect: Z = 3.08 (P = 0.002)
Test for subgroup differences: Not applicable



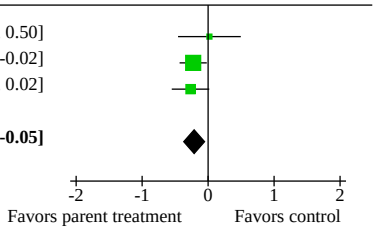
Comparison 4. Cancer follow-up

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
4.1 Parenting behavior	3	625	Std. Mean Difference (IV, Random, 95% CI)	-0.21 [-0.37, -0.05]
4.2 Parent mental health	4	667	Std. Mean Difference (IV, Random, 95% CI)	-0.23 [-0.39, -0.08]

Analysis 4.1. Comparison 4: Cancer follow-up, Outcome 1: Parenting behavior

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Sahler 2002	-73.01	13.9	34	-73.29	14.07	34	11.0%	0.02 [-0.46 , 0.50]
Sahler 2005	-14.26	2.55	179	-13.69	2.48	186	58.4%	-0.23 [-0.43 , -0.02]
Sahler 2013	-14.72	2.69	94	-14.02	2.54	98	30.6%	-0.27 [-0.55 , 0.02]
Total (95% CI)			**307**			**318**	**100.0%**	**-0.21 [-0.37 , -0.05]**

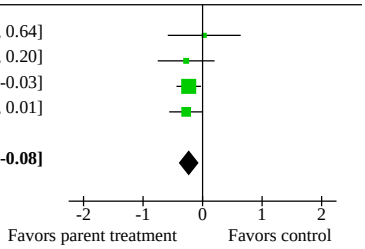
Heterogeneity: Tau² = 0.00; Chi² = 1.07, df = 2 (P = 0.58); I² = 0%
Test for overall effect: Z = 2.64 (P = 0.008)
Test for subgroup differences: Not applicable



Analysis 4.2. Comparison 4: Cancer follow-up, Outcome 2: Parent mental health

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Hoekstra-Weebers 1998	41.9	10.9	20	41.6	10.4	21	6.2%	0.03 [-0.58 , 0.64]
Sahler 2002	73.01	39.4	34	84.43	42.42	34	10.2%	-0.28 [-0.75 , 0.20]
Sahler 2005	10.32	8.55	180	12.36	8.92	186	54.9%	-0.23 [-0.44 , -0.03]
Sahler 2013	9.45	9.64	94	12.16	9.9	98	28.7%	-0.28 [-0.56 , 0.01]
Total (95% CI)			**328**			**339**	**100.0%**	**-0.23 [-0.39 , -0.08]**

Heterogeneity: Tau² = 0.00; Chi² = 0.82, df = 3 (P = 0.85); I² = 0%
Test for overall effect: Z = 3.00 (P = 0.003)
Test for subgroup differences: Not applicable



Comparison 5. Chronic pain conditions post-treatment

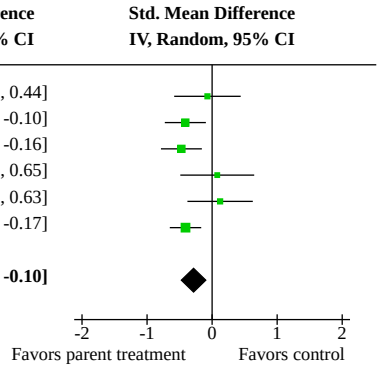
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
5.1 Parenting behavior	6	755	Std. Mean Difference (IV, Random, 95% CI)	-0.29 [-0.47, -0.10]
5.2 Parent mental health	3	490	Std. Mean Difference (IV, Random, 95% CI)	-0.24 [-0.42, -0.06]
5.3 Child behavior/disability	12	1362	Std. Mean Difference (IV, Random, 95% CI)	-0.15 [-0.28, -0.01]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
5.3.1 Active control	9	1154	Std. Mean Difference (IV, Random, 95% CI)	-0.13 [-0.26, 0.00]
5.3.2 Waitlist control	3	208	Std. Mean Difference (IV, Random, 95% CI)	-0.25 [-0.76, 0.25]
5.4 Child mental health	11	1314	Std. Mean Difference (IV, Random, 95% CI)	-0.02 [-0.13, 0.09]
5.4.1 Active control	9	1165	Std. Mean Difference (IV, Random, 95% CI)	-0.03 [-0.16, 0.09]
5.4.2 Waitlist control	2	149	Std. Mean Difference (IV, Random, 95% CI)	0.06 [-0.27, 0.38]
5.5 Child symptoms	10	1161	Std. Mean Difference (IV, Random, 95% CI)	-0.44 [-0.84, -0.03]
5.5.1 Active control	8	1018	Std. Mean Difference (IV, Random, 95% CI)	-0.13 [-0.33, 0.06]
5.5.2 Waitlist control	2	143	Std. Mean Difference (IV, Random, 95% CI)	-1.70 [-3.94, 0.55]

Analysis 5.1. Comparison 5: Chronic pain conditions post-treatment, Outcome 1: Parenting behavior

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Law 2015	1.4	0.52	31	1.44	0.58	28	10.6%	-0.07 [-0.58 , 0.44]
Levy 2016	1.42	0.48	75	1.61	0.44	83	20.9%	-0.41 [-0.73 , -0.10]
Levy 2017	0.62	0.98	80	1.04	0.78	80	21.0%	-0.47 [-0.79 , -0.16]
Palermo 2009	19.91	9.76	26	19.11	10.15	22	9.0%	0.08 [-0.49 , 0.65]
Palermo 2016a	21.93	5.02	31	21.15	7.33	30	10.9%	0.12 [-0.38 , 0.63]
Palermo 2016b	1.05	0.57	134	1.29	0.6	135	27.7%	-0.41 [-0.65 , -0.17]
Total (95% CI)			**377**			**378**	**100.0%**	**-0.29 [-0.47 , -0.10]**

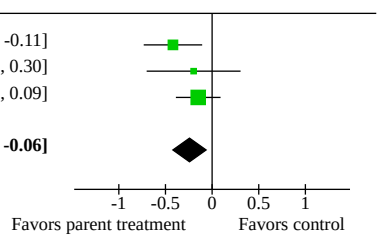
Heterogeneity: Tau² = 0.02; Chi² = 7.53, df = 5 (P = 0.18); I² = 34%
Test for overall effect: Z = 2.99 (P = 0.003)
Test for subgroup differences: Not applicable



Analysis 5.2. Comparison 5: Chronic pain conditions post-treatment, Outcome 2: Parent mental health

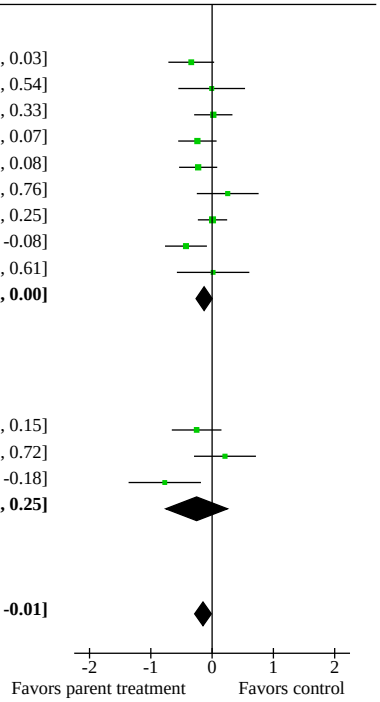
Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Levy 2017	5.34	13.29	80	10.68	11.99	80	32.2%	-0.42 [-0.73 , -0.11]
Palermo 2016a	7.87	5.82	31	9.33	8.51	30	12.5%	-0.20 [-0.70 , 0.30]
Palermo 2016b	10.22	5.96	134	11.15	6.48	135	55.3%	-0.15 [-0.39 , 0.09]
Total (95% CI)			**245**			**245**	**100.0%**	**-0.24 [-0.42 , -0.06]**

Heterogeneity: Tau² = 0.00; Chi² = 1.85, df = 2 (P = 0.40); I² = 0%
Test for overall effect: Z = 2.67 (P = 0.008)
Test for subgroup differences: Not applicable



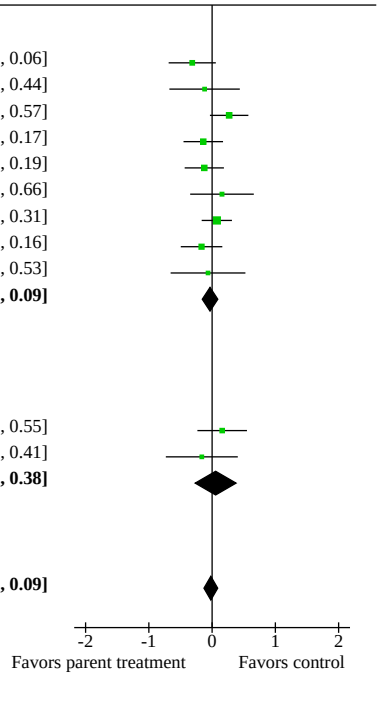
Analysis 5.3. Comparison 5: Chronic pain conditions post-treatment, Outcome 3: Child behavior/disability

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
5.3.1 Active control								
Kashikar-Zuck 2012	16.7	8.7	57	19.8	9.4	55	8.9%	-0.34 [-0.71 , 0.03]
Law 2015	4.83	4.78	20	4.86	4.4	37	5.1%	-0.01 [-0.55 , 0.54]
Levy 2010	0.56	0.54	83	0.55	0.48	75	11.1%	0.02 [-0.29 , 0.33]
Levy 2016	5.6	5.7	80	7.3	8.2	78	11.1%	-0.24 [-0.55 , 0.07]
Levy 2017	5.51	8.14	80	7.65	10.44	80	11.1%	-0.23 [-0.54 , 0.08]
Palermo 2016a	9.52	6.47	31	8.1	4.28	30	5.7%	0.25 [-0.25 , 0.76]
Palermo 2016b	5.68	4.38	134	5.65	4.69	135	14.6%	0.01 [-0.23 , 0.25]
Powers 2013	15.5	17.4	64	29.6	42.2	71	9.9%	-0.43 [-0.77 , -0.08]
Sanders 1994	2.39	7.15	22	2.28	5.96	22	4.4%	0.02 [-0.57 , 0.61]
Subtotal (95% CI)			**571**			**583**	**81.9%**	**-0.13 [-0.26 , 0.00]**
Heterogeneity: Tau² = 0.01; Chi² = 9.77, df = 8 (P = 0.28); I² = 18%								
Test for overall effect: Z = 1.95 (P = 0.05)								
5.3.2 Waitlist control								
Bonnert 2017	1.04	1.05	44	1.31	1.07	51	7.9%	-0.25 [-0.66 , 0.15]
Daniel 2015	-60.4	23.89	24	-64.6	16.94	41	5.7%	0.21 [-0.30 , 0.72]
Palermo 2009	3.6	2.86	26	6.62	4.76	22	4.4%	-0.77 [-1.36 , -0.18]
Subtotal (95% CI)			**94**			**114**	**18.1%**	**-0.25 [-0.76 , 0.25]**
Heterogeneity: Tau² = 0.13; Chi² = 6.17, df = 2 (P = 0.05); I² = 68%								
Test for overall effect: Z = 0.99 (P = 0.32)								
Total (95% CI)			**665**			**697**	**100.0%**	**-0.15 [-0.28 , -0.01]**
Heterogeneity: Tau² = 0.02; Chi² = 16.35, df = 11 (P = 0.13); I² = 33%								
Test for overall effect: Z = 2.14 (P = 0.03)								
Test for subgroup differences: Chi² = 0.21, df = 1 (P = 0.64), I² = 0%								

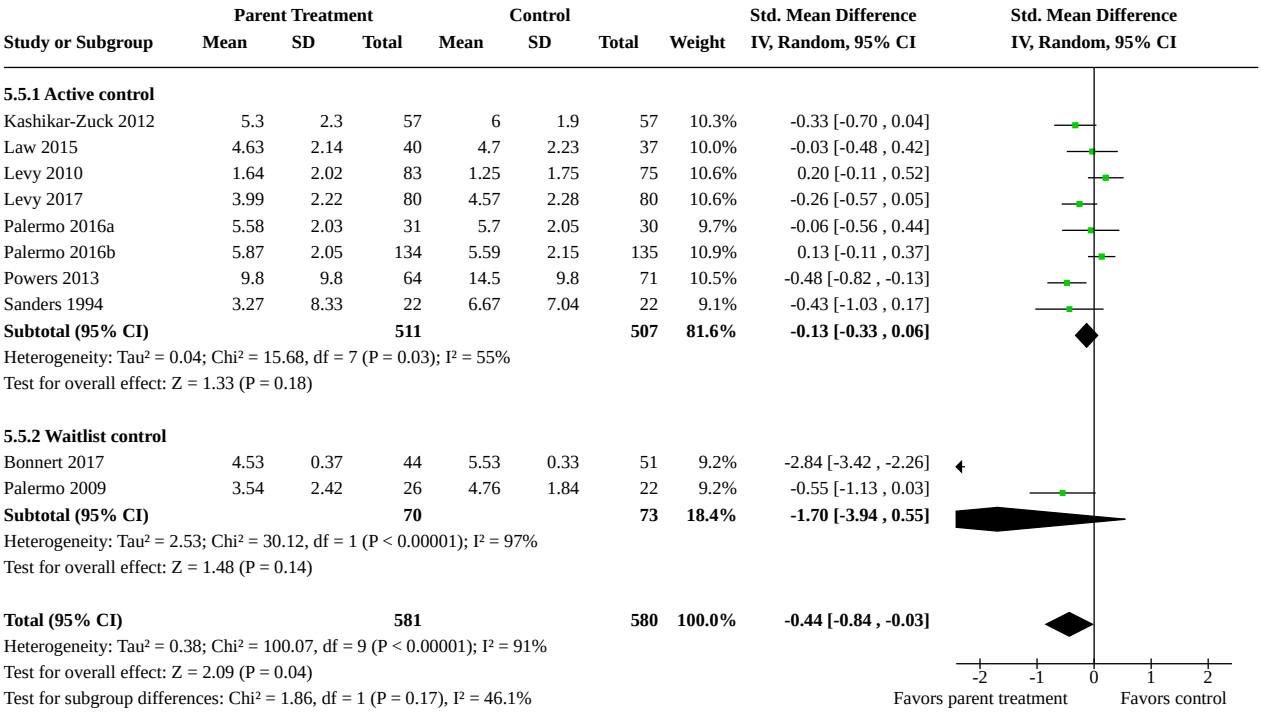


Analysis 5.4. Comparison 5: Chronic pain conditions post-treatment, Outcome 4: Child mental health

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
5.4.1 Active control								
Kashikar-Zuck 2012	9.9	6.2	57	11.8	5.8	55	8.5%	-0.31 [-0.69 , 0.06]
Law 2015	46.3	10.03	27	47.48	9.5	23	3.8%	-0.12 [-0.68 , 0.44]
Levy 2010	9.96	6.16	84	8.35	5.73	84	12.7%	0.27 [-0.03 , 0.57]
Levy 2016	8.2	2.8	80	8.6	2.9	78	12.1%	-0.14 [-0.45 , 0.17]
Levy 2017	1.09	1.88	80	1.28	1.07	80	12.2%	-0.12 [-0.43 , 0.19]
Palermo 2016a	12.03	5.13	31	11.2	5.37	30	4.6%	0.16 [-0.35 , 0.66]
Palermo 2016b	9.71	5.1	134	9.32	5.37	135	20.6%	0.07 [-0.16 , 0.31]
Powers 2013	4.6	5.6	71	5.56	5.83	72	10.9%	-0.17 [-0.50 , 0.16]
Sanders 1994	57.5	11.5	22	58.1	5.8	22	3.4%	-0.06 [-0.66 , 0.53]
Subtotal (95% CI)			**586**			**579**	**88.7%**	**-0.03 [-0.16 , 0.09]**
Heterogeneity: Tau² = 0.00; Chi² = 8.82, df = 8 (P = 0.36); I² = 9%								
Test for overall effect: Z = 0.53 (P = 0.60)								
5.4.2 Waitlist control								
Bonnert 2017	25.23	16.23	47	22.62	16.31	54	7.7%	0.16 [-0.23 , 0.55]
Palermo 2009	58.96	13.1	26	61.59	18.67	22	3.6%	-0.16 [-0.73 , 0.41]
Subtotal (95% CI)			**73**			**76**	**11.3%**	**0.06 [-0.27 , 0.38]**
Heterogeneity: Tau² = 0.00; Chi² = 0.84, df = 1 (P = 0.36); I² = 0%								
Test for overall effect: Z = 0.34 (P = 0.74)								
Total (95% CI)			**659**			**655**	**100.0%**	**-0.02 [-0.13 , 0.09]**
Heterogeneity: Tau² = 0.00; Chi² = 9.90, df = 10 (P = 0.45); I² = 0%								
Test for overall effect: Z = 0.37 (P = 0.71)								
Test for subgroup differences: Chi² = 0.25, df = 1 (P = 0.62), I² = 0%								



Analysis 5.5. Comparison 5: Chronic pain conditions post-treatment, Outcome 5: Child symptoms



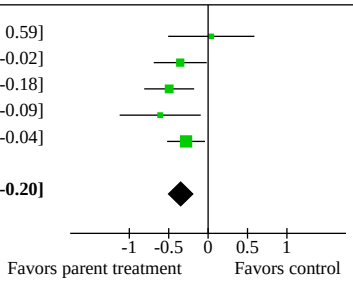
Comparison 6. Chronic pain conditions follow-up

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
6.1 Parenting behavior	5	678	Std. Mean Difference (IV, Random, 95% CI)	-0.35 [-0.50, -0.20]
6.2 Parent mental health	3	482	Std. Mean Difference (IV, Random, 95% CI)	-0.20 [-0.38, -0.02]
6.3 Child behavior/disability	9	1099	Std. Mean Difference (IV, Random, 95% CI)	-0.27 [-0.39, -0.15]
6.4 Child mental health	9	1108	Std. Mean Difference (IV, Random, 95% CI)	-0.02 [-0.14, 0.09]
6.5 Child symptoms	8	966	Std. Mean Difference (IV, Random, 95% CI)	-0.12 [-0.32, 0.09]

Analysis 6.1. Comparison 6: Chronic pain conditions follow-up, Outcome 1: Parenting behavior

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Law 2015	1.36	0.39	29	1.34	0.59	23	7.8%	0.04 [-0.51 , 0.59]
Levy 2016	1.31	0.48	68	1.49	0.53	70	20.5%	-0.35 [-0.69 , -0.02]
Levy 2017	0.54	0.48	76	0.84	0.7	82	23.1%	-0.49 [-0.81 , -0.18]
Palermo 2016a	18.32	5.98	31	21.98	5.9	30	8.8%	-0.61 [-1.12 , -0.09]
Palermo 2016b	1	0.58	134	1.17	0.63	135	39.8%	-0.28 [-0.52 , -0.04]
Total (95% CI)			**338**			**340**	**100.0%**	**-0.35 [-0.50 , -0.20]**

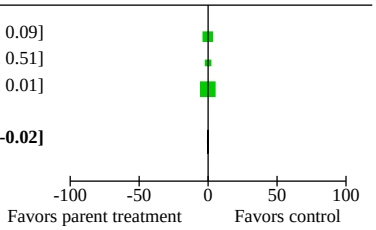
Heterogeneity: Tau² = 0.00; Chi² = 4.04, df = 4 (P = 0.40); I² = 1%
Test for overall effect: Z = 4.46 (P < 0.00001)
Test for subgroup differences: Not applicable



Analysis 6.2. Comparison 6: Chronic pain conditions follow-up, Outcome 2: Parent mental health

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Levy 2017	5.43	9.25	74	7.69	10.17	78	31.5%	-0.23 [-0.55 , 0.09]
Palermo 2016a	7.21	8.26	31	7.16	8.61	30	12.7%	0.01 [-0.50 , 0.51]
Palermo 2016b	9.47	5.87	134	10.85	6.25	135	55.8%	-0.23 [-0.47 , 0.01]
Total (95% CI)			**239**			**243**	**100.0%**	**-0.20 [-0.38 , -0.02]**

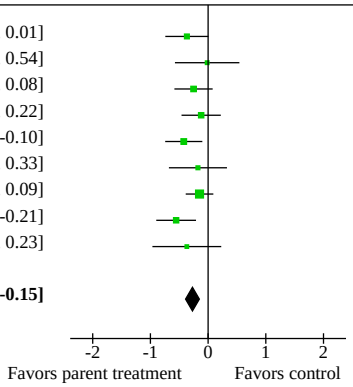
Heterogeneity: Tau² = 0.00; Chi² = 0.73, df = 2 (P = 0.69); I² = 0%
Test for overall effect: Z = 2.17 (P = 0.03)
Test for subgroup differences: Not applicable



Analysis 6.3. Comparison 6: Chronic pain conditions follow-up, Outcome 3: Child behavior/disability

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Kashikar-Zuck 2012	13.4	8.9	57	17	10.5	55	10.2%	-0.37 [-0.74 , 0.01]
Law 2015	5.19	5.02	28	5.27	4.61	22	4.6%	-0.02 [-0.57 , 0.54]
Levy 2010	0.36	0.39	80	0.48	0.56	63	12.9%	-0.25 [-0.58 , 0.08]
Levy 2016	5.1	6.4	67	5.9	6.8	66	12.3%	-0.12 [-0.46 , 0.22]
Levy 2017	4.51	6.64	74	7.6	7.85	78	13.7%	-0.42 [-0.74 , -0.10]
Palermo 2016a	7.84	5.5	31	8.75	4.64	30	5.6%	-0.18 [-0.68 , 0.33]
Palermo 2016b	5.46	4.32	134	6.16	5.04	135	24.8%	-0.15 [-0.39 , 0.09]
Powers 2013	7.1	14.4	64	21.8	33.7	71	12.0%	-0.55 [-0.90 , -0.21]
Sanders 1994	2.28	5.96	22	5.57	10.86	22	4.0%	-0.37 [-0.97 , 0.23]
Total (95% CI)			**557**			**542**	**100.0%**	**-0.27 [-0.39 , -0.15]**

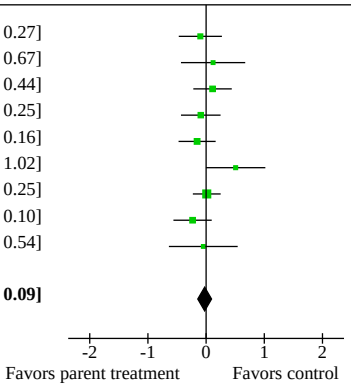
Heterogeneity: Tau² = 0.00; Chi² = 6.51, df = 8 (P = 0.59); I² = 0%
Test for overall effect: Z = 4.46 (P < 0.00001)
Test for subgroup differences: Not applicable



Analysis 6.4. Comparison 6: Chronic pain conditions follow-up, Outcome 4: Child mental health

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Kashikar-Zuck 2012	8.7	6.1	57	9.3	5.9	55	10.2%	-0.10 [-0.47 , 0.27]
Law 2015	44.75	9.52	28	43.74	6.45	23	4.6%	0.12 [-0.43 , 0.67]
Levy 2010	7.89	6.99	80	7.19	5.27	63	12.8%	0.11 [-0.22 , 0.44]
Levy 2016	7.9	3.3	67	8.2	3.2	66	12.1%	-0.09 [-0.43 , 0.25]
Levy 2017	0.88	1.76	74	1.1	0.98	78	13.8%	-0.15 [-0.47 , 0.16]
Palermo 2016a	11.53	5.37	31	8.71	5.6	30	5.4%	0.51 [-0.00 , 1.02]
Palermo 2016b	9.55	5.13	134	9.49	5.58	135	24.4%	0.01 [-0.23 , 0.25]
Powers 2013	2.85	4.9	71	4.07	5.51	72	12.9%	-0.23 [-0.56 , 0.10]
Sanders 1994	58.1	12.2	22	58.6	7.5	22	4.0%	-0.05 [-0.64 , 0.54]
Total (95% CI)			**564**			**544**	**100.0%**	**-0.02 [-0.14 , 0.09]**

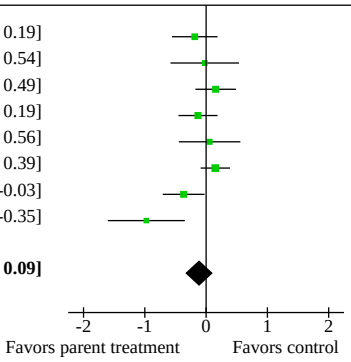
Heterogeneity: Tau² = 0.00; Chi² = 7.66, df = 8 (P = 0.47); I² = 0%
Test for overall effect: Z = 0.41 (P = 0.68)
Test for subgroup differences: Not applicable



Analysis 6.5. Comparison 6: Chronic pain conditions follow-up, Outcome 5: Child symptoms

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Kashikar-Zuck 2012	4.9	2.2	57	5.3	2.1	55	13.2%	-0.18 [-0.56 , 0.19]
Law 2015	3.86	2.19	28	3.91	2.39	22	8.6%	-0.02 [-0.58 , 0.54]
Levy 2010	0.93	1.42	80	0.7	1.53	63	14.5%	0.16 [-0.17 , 0.49]
Levy 2017	3.47	2.33	74	3.79	2.48	78	14.9%	-0.13 [-0.45 , 0.19]
Palermo 2016a	5.42	2.05	31	5.3	2.12	30	9.8%	0.06 [-0.45 , 0.56]
Palermo 2016b	5.85	1.97	134	5.55	2.02	135	17.5%	0.15 [-0.09 , 0.39]
Powers 2013	7.5	9	64	11.1	10.4	71	14.1%	-0.37 [-0.71 , -0.03]
Sanders 1994	0.36	0.77	22	3.97	5.08	22	7.4%	-0.98 [-1.60 , -0.35]
Total (95% CI)			**490**			**476**	**100.0%**	**-0.12 [-0.32 , 0.09]**

Heterogeneity: Tau² = 0.05; Chi² = 16.71, df = 7 (P = 0.02); I² = 58%
Test for overall effect: Z = 1.09 (P = 0.28)
Test for subgroup differences: Not applicable



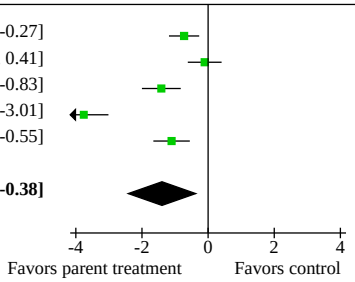
Comparison 7. Diabetes post-treatment

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
7.1 Parenting behavior	5	338	Std. Mean Difference (IV, Random, 95% CI)	-1.39 [-2.41, -0.38]
7.2 Parent mental health	3	211	Std. Mean Difference (IV, Random, 95% CI)	-0.24 [-0.90, 0.42]
7.3 Child mental health	6	467	Std. Mean Difference (IV, Random, 95% CI)	-0.09 [-0.40, 0.21]
7.4 Child symptoms	13	1339	Std. Mean Difference (IV, Random, 95% CI)	-0.02 [-0.25, 0.21]
7.5 Family functioning	9	701	Std. Mean Difference (IV, Random, 95% CI)	-0.15 [-0.31, 0.01]

Analysis 7.1. Comparison 7: Diabetes post-treatment, Outcome 1: Parenting behavior

Study or Subgroup	Parent treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Doherty 2013	2.61	0.64	42	3.13	0.78	37	20.5%	-0.73 [-1.18 , -0.27]
Ellis 2017a	-4.22	1.59	41	-4.08	0.68	23	20.3%	-0.10 [-0.61 , 0.41]
Husted 2014	-37	1.5	26	-35	1.3	31	20.0%	-1.41 [-2.00 , -0.83]
May 2017	-7.85	0.3	39	-6.73	0.29	40	19.2%	-3.76 [-4.51 , -3.01]
Westrupp 2015	2.13	0.65	28	2.84	0.62	31	20.1%	-1.10 [-1.66 , -0.55]
Total (95% CI)			**176**			**162**	**100.0%**	**-1.39 [-2.41 , -0.38]**

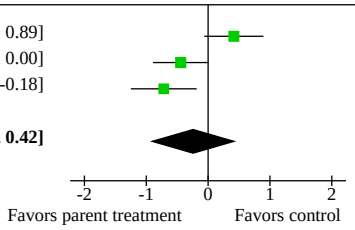
Heterogeneity: Tau² = 1.26; Chi² = 67.15, df = 4 (P < 0.00001); I² = 94%
Test for overall effect: Z = 2.68 (P = 0.007)
Test for subgroup differences: Not applicable



Analysis 7.2. Comparison 7: Diabetes post-treatment, Outcome 2: Parent mental health

Study or Subgroup	Parent treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Ambrosino 2008	12.62	8.39	47	9.3	6.9	27	33.5%	0.42 [-0.06 , 0.89]
Doherty 2013	175.69	63.27	42	203.19	59.33	37	34.3%	-0.44 [-0.89 , 0.00]
Westrupp 2015	1.17	2.21	28	4.57	6.14	30	32.2%	-0.72 [-1.25 , -0.18]
Total (95% CI)			**117**			**94**	**100.0%**	**-0.24 [-0.90 , 0.42]**

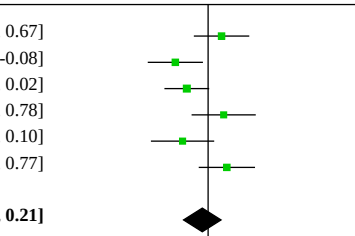
Heterogeneity: Tau² = 0.28; Chi² = 11.11, df = 2 (P = 0.004); I² = 82%
Test for overall effect: Z = 0.72 (P = 0.47)
Test for subgroup differences: Not applicable



Analysis 7.3. Comparison 7: Diabetes post-treatment, Outcome 3: Child mental health

Study or Subgroup	Parent treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Ambrosino 2008	5.39	5.72	51	4.1	6	30	16.9%	0.22 [-0.23 , 0.67]
Doherty 2013	82.24	29.93	42	100.51	37.79	37	16.9%	-0.53 [-0.98 , -0.08]
Ellis 2005	51.9	29.8	59	61.8	26.7	58	19.4%	-0.35 [-0.71 , 0.02]
Husted 2014	-60	4.2	26	-61	3.6	31	15.0%	0.25 [-0.27 , 0.78]
Westrupp 2015	47.31	8.27	29	51.5	11.28	30	15.2%	-0.42 [-0.93 , 0.10]
Wysocki 1999	-73.6	11.3	35	-77	10.7	39	16.7%	0.31 [-0.15 , 0.77]
Total (95% CI)			**242**			**225**	**100.0%**	**-0.09 [-0.40 , 0.21]**

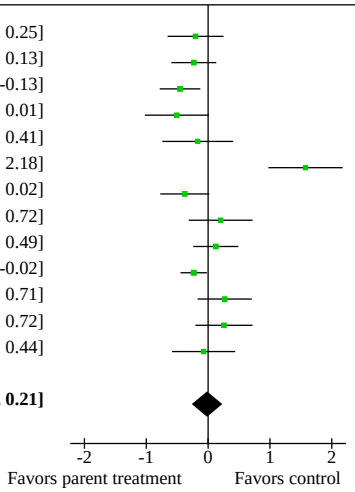
Heterogeneity: Tau² = 0.09; Chi² = 13.45, df = 5 (P = 0.02); I² = 63%
Test for overall effect: Z = 0.61 (P = 0.54)
Test for subgroup differences: Not applicable



Analysis 7.4. Comparison 7: Diabetes post-treatment, Outcome 4: Child symptoms

Study or Subgroup	Parent treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Ambrosino 2008	7.04	1.29	51	7.3	1.23	30	7.6%	-0.20 [-0.66 , 0.25]
Ellis 2005	10.72	2.59	59	11.29	2.3	58	8.5%	-0.23 [-0.59 , 0.13]
Ellis 2012	10.41	2.45	74	11.54	2.5	72	8.8%	-0.45 [-0.78 , -0.13]
Ellis 2017a	10.04	1.79	41	11.04	2.23	23	6.9%	-0.50 [-1.02 , 0.01]
Ellis 2017b	11.03	2.1	23	11.39	2.12	24	6.4%	-0.17 [-0.74 , 0.41]
Husted 2014	9.5	0.3	26	9.1	0.2	31	6.2%	1.58 [0.97 , 2.18]
Laffel 2003	8.2	1.1	50	8.7	1.5	50	8.1%	-0.38 [-0.77 , 0.02]
Mayer-Davis 2015	83	16	29	80	13	29	7.0%	0.20 [-0.31 , 0.72]
Nansel 2009	8.8	1.9	58	8.6	1.2	58	8.5%	0.13 [-0.24 , 0.49]
Nansel 2012	8.78	1.37	172	9.11	1.46	168	9.8%	-0.23 [-0.45 , -0.02]
Westrupp 2015	7.94	0.85	41	7.71	0.85	40	7.7%	0.27 [-0.17 , 0.71]
Wysocki 1999	12.3	2.9	35	11.6	2.5	38	7.5%	0.26 [-0.20 , 0.72]
Wysocki 2006	8.8	1.5	28	8.9	1.2	31	7.0%	-0.07 [-0.58 , 0.44]
Total (95% CI)			**687**			**652**	**100.0%**	**-0.02 [-0.25 , 0.21]**

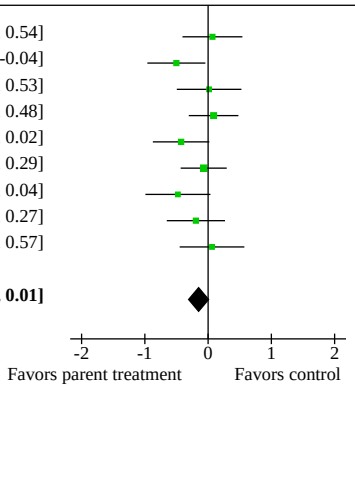
Heterogeneity: Tau² = 0.13; Chi² = 48.56, df = 12 (P < 0.00001); I² = 75%
Test for overall effect: Z = 0.15 (P = 0.88)
Test for subgroup differences: Not applicable



Analysis 7.5. Comparison 7: Diabetes post-treatment, Outcome 5: Family functioning

Study or Subgroup	Parent treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Ambrosino 2008	67.22	7.35	47	66.71	7.39	27	10.2%	0.07 [-0.40 , 0.54]
Doherty 2013	23.66	4.33	41	25.97	4.81	35	10.8%	-0.50 [-0.96 , -0.04]
Ellis 2017a	3.45	2.515	41	3.4	3.99	23	8.9%	0.02 [-0.49 , 0.53]
Laffel 2003	3.1	3.9	50	2.8	2.9	50	14.3%	0.09 [-0.31 , 0.48]
May 2017	-5.24	0.26	39	-5.13	0.25	40	11.3%	-0.43 [-0.87 , 0.02]
Nansel 2009	25	8.3	58	25.6	8.8	58	16.3%	-0.07 [-0.43 , 0.29]
Westrupp 2015	21.38	2.43	29	22.8	3.34	31	8.7%	-0.48 [-0.99 , 0.04]
Wysocki 1999	50.2	6.7	35	51.4	5.6	38	10.7%	-0.19 [-0.65 , 0.27]
Wysocki 2006	50	6.7	28	49.6	6.1	31	8.8%	0.06 [-0.45 , 0.57]
Total (95% CI)			**368**			**333**	**100.0%**	**-0.15 [-0.31 , 0.01]**

Heterogeneity: Tau² = 0.01; Chi² = 8.80, df = 8 (P = 0.36); I² = 9%
Test for overall effect: Z = 1.86 (P = 0.06)
Test for subgroup differences: Not applicable



Comparison 8. Diabetes follow-up

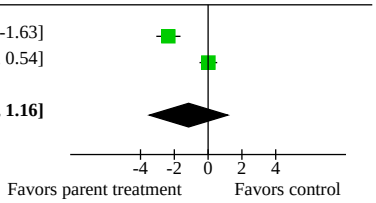
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
8.1 Parenting behavior	2	110	Std. Mean Difference (IV, Random, 95% CI)	-1.15 [-3.47, 1.16]
8.2 Parent mental health	2	130	Std. Mean Difference (IV, Random, 95% CI)	0.15 [-0.63, 0.93]
8.3 Child mental health	2	110	Std. Mean Difference (IV, Random, 95% CI)	0.64 [-0.94, 2.22]
8.4 Child symptoms	6	518	Std. Mean Difference (IV, Random, 95% CI)	-0.04 [-0.35, 0.27]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
8.5 Family functioning	2	158	Std. Mean Difference (IV, Random, 95% CI)	0.11 [-0.23, 0.44]

Analysis 8.1. Comparison 8: Diabetes follow-up, Outcome 1: Parenting behavior

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Husted 2014	-40	1.2	23	-37	1.3	30	49.4%	-2.35 [-3.06 , -1.63]
Westrupp 2015	2.53	0.69	32	2.52	0.59	25	50.6%	0.02 [-0.51 , 0.54]
Total (95% CI)			**55**			**55**	**100.0%**	**-1.15 [-3.47 , 1.16]**

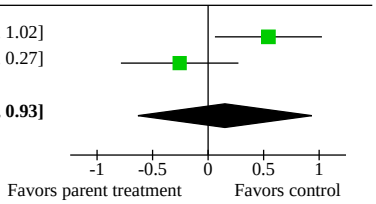
Heterogeneity: Tau² = 2.69; Chi² = 27.37, df = 1 (P < 0.00001); I² = 96%
Test for overall effect: Z = 0.98 (P = 0.33)
Test for subgroup differences: Not applicable



Analysis 8.2. Comparison 8: Diabetes follow-up, Outcome 2: Parent mental health

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Ambrosino 2008	12.6	7.91	47	8.74	5.12	27	51.0%	0.54 [0.06 , 1.02]
Westrupp 2015	2.12	3.11	31	2.96	3.38	25	49.0%	-0.26 [-0.79 , 0.27]
Total (95% CI)			**78**			**52**	**100.0%**	**0.15 [-0.63 , 0.93]**

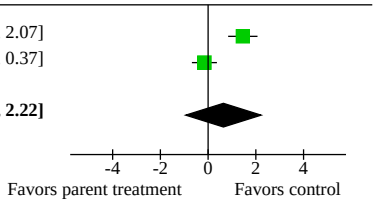
Heterogeneity: Tau² = 0.25; Chi² = 4.79, df = 1 (P = 0.03); I² = 79%
Test for overall effect: Z = 0.38 (P = 0.70)
Test for subgroup differences: Not applicable



Analysis 8.3. Comparison 8: Diabetes follow-up, Outcome 3: Child mental health

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Husted 2014	-56	4.8	23	-62	3.4	30	49.5%	1.45 [0.84 , 2.07]
Westrupp 2015	48.16	10.55	32	50.16	15.04	25	50.5%	-0.16 [-0.68 , 0.37]
Total (95% CI)			**55**			**55**	**100.0%**	**0.64 [-0.94 , 2.22]**

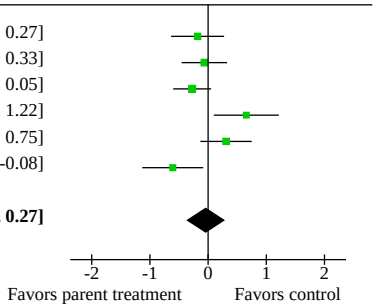
Heterogeneity: Tau² = 1.21; Chi² = 15.26, df = 1 (P < 0.0001); I² = 93%
Test for overall effect: Z = 0.80 (P = 0.43)
Test for subgroup differences: Not applicable



Analysis 8.4. Comparison 8: Diabetes follow-up, Outcome 4: Child symptoms

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Ambrosino 2008	7.19	1.03	49	7.39	1.2	30	16.4%	-0.18 [-0.64 , 0.27]
Ellis 2005	10.95	2.62	49	11.12	2.67	52	18.1%	-0.06 [-0.45 , 0.33]
Ellis 2012	10.95	2.83	74	11.72	2.75	72	19.9%	-0.27 [-0.60 , 0.05]
Husted 2014	9.6	0.3	23	9.4	0.3	30	14.0%	0.66 [0.10 , 1.22]
Westrupp 2015	7.9	1.04	40	7.59	0.95	40	16.8%	0.31 [-0.13 , 0.75]
Wysocki 2006	8.7	1.3	28	9.5	1.3	31	14.8%	-0.61 [-1.13 , -0.08]
Total (95% CI)			**263**			**255**	**100.0%**	**-0.04 [-0.35 , 0.27]**

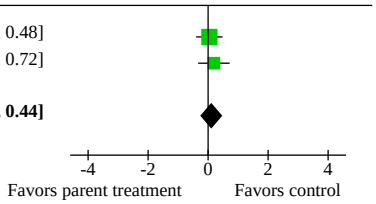
Heterogeneity: Tau² = 0.10; Chi² = 15.12, df = 5 (P = 0.010); I² = 67%
Test for overall effect: Z = 0.26 (P = 0.79)
Test for subgroup differences: Not applicable



Analysis 8.5. Comparison 8: Diabetes follow-up, Outcome 5: Family functioning

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Ambrosino 2008	66.02	6.94	74	65.71	7.68	27	58.6%	0.04 [-0.40 , 0.48]
Westrupp 2015	23.44	5.24	32	22.56	3.29	25	41.4%	0.19 [-0.33 , 0.72]
Total (95% CI)			**106**			**52**	**100.0%**	**0.11 [-0.23 , 0.44]**

Heterogeneity: Tau² = 0.00; Chi² = 0.18, df = 1 (P = 0.67); I² = 0%
Test for overall effect: Z = 0.61 (P = 0.54)
Test for subgroup differences: Not applicable



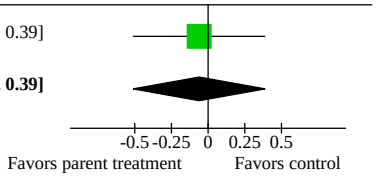
Comparison 9. Skin diseases post-treatment

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
9.1 Parenting behavior	1	77	Std. Mean Difference (IV, Random, 95% CI)	-0.06 [-0.51, 0.39]
9.2 Child mental health	1	75	Mean Difference (IV, Random, 95% CI)	1.01 [-12.08, 14.10]
9.3 Child symptoms	1	72	Std. Mean Difference (IV, Random, 95% CI)	-0.42 [-0.89, 0.05]
9.4 Family functioning	1	77	Std. Mean Difference (IV, Random, 95% CI)	0.05 [-0.40, 0.50]

Analysis 9.1. Comparison 9: Skin diseases post-treatment, Outcome 1: Parenting behavior

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Morawska 2016	-8.01	1.26	34	-7.93	1.33	43	100.0%	-0.06 [-0.51 , 0.39]
Total (95% CI)			**34**			**43**	**100.0%**	**-0.06 [-0.51 , 0.39]**

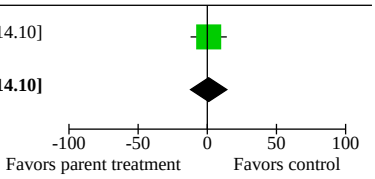
Heterogeneity: Not applicable
Test for overall effect: Z = 0.27 (P = 0.79)
Test for subgroup differences: Not applicable



Analysis 9.2. Comparison 9: Skin diseases post-treatment, Outcome 2: Child mental health

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
Morawska 2016	78.2	28.61	32	77.19	28.6	43	100.0%	1.01 [-12.08 , 14.10]
Total (95% CI)			**32**			**43**	**100.0%**	**1.01 [-12.08 , 14.10]**

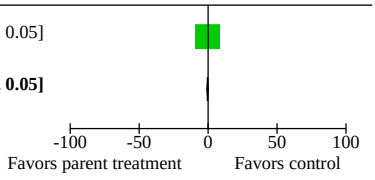
Heterogeneity: Not applicable
Test for overall effect: Z = 0.15 (P = 0.88)
Test for subgroup differences: Not applicable



Analysis 9.3. Comparison 9: Skin diseases post-treatment, Outcome 3: Child symptoms

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Morawska 2016	10.97	6.12	31	13.52	5.99	41	100.0%	-0.42 [-0.89 , 0.05]
Total (95% CI)			**31**			**41**	**100.0%**	**-0.42 [-0.89 , 0.05]**

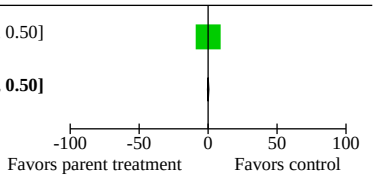
Heterogeneity: Not applicable
Test for overall effect: Z = 1.73 (P = 0.08)
Test for subgroup differences: Not applicable



Analysis 9.4. Comparison 9: Skin diseases post-treatment, Outcome 4: Family functioning

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Morawska 2016	-61.95	25.89	34	-63.01	19.43	43	100.0%	0.05 [-0.40 , 0.50]
Total (95% CI)			**34**			**43**	**100.0%**	**0.05 [-0.40 , 0.50]**

Heterogeneity: Not applicable
Test for overall effect: Z = 0.20 (P = 0.84)
Test for subgroup differences: Not applicable



Comparison 10. Skin diseases follow-up

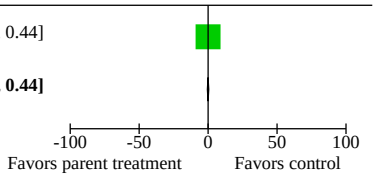
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
10.1 Parenting behavior	1	69	Std. Mean Difference (IV, Random, 95% CI)	-0.03 [-0.51, 0.44]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
10.2 Child mental health	1	69	Mean Difference (IV, Random, 95% CI)	-10.90 [-22.99, 1.19]
10.3 Child symptoms	1	70	Std. Mean Difference (IV, Random, 95% CI)	-0.48 [-0.96, -0.01]
10.4 Family functioning	1	70	Std. Mean Difference (IV, Random, 95% CI)	-0.19 [-0.66, 0.28]

Analysis 10.1. Comparison 10: Skin diseases follow-up, Outcome 1: Parenting behavior

	Parent Treatment			Control				Std. Mean Difference	Std. Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI	IV, Random, 95% CI
Morawska 2016	-8.06	1.7	32	-8.01	1.16	37	100.0%	-0.03 [-0.51 , 0.44]	
Total (95% CI)			**32**			**37**	**100.0%**	**-0.03 [-0.51 , 0.44]**	

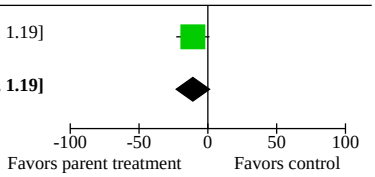
Heterogeneity: Not applicable
Test for overall effect: Z = 0.14 (P = 0.89)
Test for subgroup differences: Not applicable



Analysis 10.2. Comparison 10: Skin diseases follow-up, Outcome 2: Child mental health

	Parent Treatment			Control				Mean Difference	Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI	IV, Random, 95% CI
Morawska 2016	63.78	24.99	32	74.68	26.18	37	100.0%	-10.90 [-22.99 , 1.19]	
Total (95% CI)			**32**			**37**	**100.0%**	**-10.90 [-22.99 , 1.19]**	

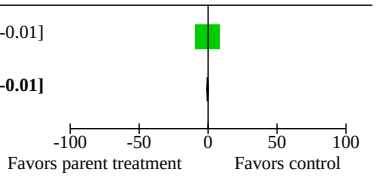
Heterogeneity: Not applicable
Test for overall effect: Z = 1.77 (P = 0.08)
Test for subgroup differences: Not applicable



Analysis 10.3. Comparison 10: Skin diseases follow-up, Outcome 3: Child symptoms

	Parent Treatment			Control				Std. Mean Difference	Std. Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI	IV, Random, 95% CI
Morawska 2016	9.31	6.03	32	12.11	5.43	38	100.0%	-0.48 [-0.96 , -0.01]	
Total (95% CI)			**32**			**38**	**100.0%**	**-0.48 [-0.96 , -0.01]**	

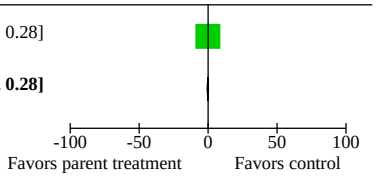
Heterogeneity: Not applicable
Test for overall effect: Z = 1.99 (P = 0.05)
Test for subgroup differences: Not applicable



Analysis 10.4. Comparison 10: Skin diseases follow-up, Outcome 4: Family functioning

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Morawska 2016	-64.26	20.05	33	-60.05	24.05	37	100.0%	-0.19 [-0.66 , 0.28]
Total (95% CI)			**33**			**37**	**100.0%**	**-0.19 [-0.66 , 0.28]**

Heterogeneity: Not applicable
Test for overall effect: Z = 0.78 (P = 0.44)
Test for subgroup differences: Not applicable



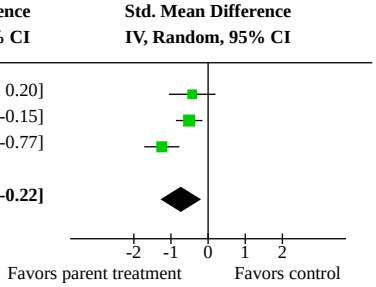
Comparison 11. Traumatic brain injury post-treatment

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
11.1 Parenting behavior	3	254	Std. Mean Difference (IV, Random, 95% CI)	-0.74 [-1.25, -0.22]
11.2 Parent mental health	2	165	Std. Mean Difference (IV, Random, 95% CI)	-0.51 [-0.87, -0.16]
11.3 Child behavior/disability	1	121	Std. Mean Difference (IV, Random, 95% CI)	-0.08 [-0.44, 0.28]
11.4 Child mental health	3	251	Std. Mean Difference (IV, Random, 95% CI)	-0.43 [-0.69, -0.18]
11.5 Family functioning	1	121	Std. Mean Difference (IV, Random, 95% CI)	-0.23 [-0.59, 0.12]

Analysis 11.1. Comparison 11: Traumatic brain injury post-treatment, Outcome 1: Parenting behavior

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Wade 2006a	-73.45	9.61	20	-69.16	10.02	20	27.7%	-0.43 [-1.06 , 0.20]
Wade 2014	-91.9	7.2	61	-87.2	10.7	64	38.5%	-0.51 [-0.87 , -0.15]
Wade 2017	-8.95	7.2	57	-1.5	2.2	32	33.8%	-1.25 [-1.72 , -0.77]
Total (95% CI)			**138**			**116**	**100.0%**	**-0.74 [-1.25 , -0.22]**

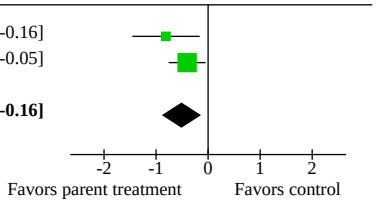
Heterogeneity: $Tau^2 = 0.14$; $Chi^2 = 6.95$, df = 2 (P = 0.03); $I^2 = 71\%$
Test for overall effect: Z = 2.82 (P = 0.005)
Test for subgroup differences: Not applicable



Analysis 11.2. Comparison 11: Traumatic brain injury post-treatment, Outcome 2: Parent mental health

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Wade 2006a	9.25	7.09	20	18.15	13.49	20	26.9%	-0.81 [-1.46 , -0.16]
Wade 2014	11.1	9.3	61	15.4	11.7	64	73.1%	-0.40 [-0.76 , -0.05]
Total (95% CI)			**81**			**84**	**100.0%**	**-0.51 [-0.87 , -0.16]**

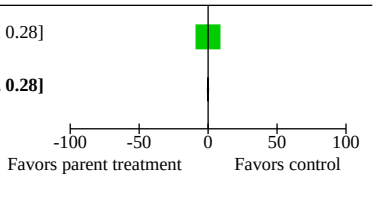
Heterogeneity: Tau² = 0.01; Chi² = 1.16, df = 1 (P = 0.28); I² = 14%
Test for overall effect: Z = 2.85 (P = 0.004)
Test for subgroup differences: Not applicable



Analysis 11.3. Comparison 11: Traumatic brain injury post-treatment, Outcome 3: Child behavior/disability

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Wade 2014	43	39.42	60	46.07	38.18	61	100.0%	-0.08 [-0.44 , 0.28]
Total (95% CI)			**60**			**61**	**100.0%**	**-0.08 [-0.44 , 0.28]**

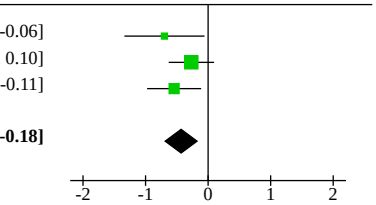
Heterogeneity: Not applicable
Test for overall effect: Z = 0.43 (P = 0.67)
Test for subgroup differences: Not applicable



Analysis 11.4. Comparison 11: Traumatic brain injury post-treatment, Outcome 4: Child mental health

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Wade 2006a	47.78	11.43	20	56.06	11.82	20	15.8%	-0.70 [-1.34 , -0.06]
Wade 2014	49.37	12.13	57	52.56	11.6	61	49.4%	-0.27 [-0.63 , 0.10]
Wade 2017	49.8	8.4	60	54.5	8.9	33	34.8%	-0.54 [-0.98 , -0.11]
Total (95% CI)			**137**			**114**	**100.0%**	**-0.43 [-0.69 , -0.18]**

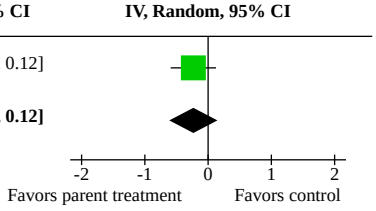
Heterogeneity: Tau² = 0.00; Chi² = 1.71, df = 2 (P = 0.43); I² = 0%
Test for overall effect: Z = 3.32 (P = 0.0009)
Test for subgroup differences: Not applicable



Analysis 11.5. Comparison 11: Traumatic brain injury post-treatment, Outcome 5: Family functioning

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Wade 2014	1.87	0.41	58	1.97	0.44	63	100.0%	-0.23 [-0.59 , 0.12]
Total (95% CI)			**58**			**63**	**100.0%**	**-0.23 [-0.59 , 0.12]**

Heterogeneity: Not applicable
Test for overall effect: Z = 1.28 (P = 0.20)
Test for subgroup differences: Not applicable



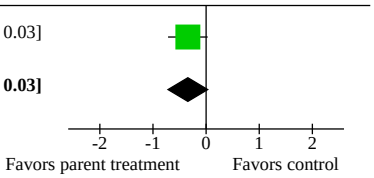
Comparison 12. Traumatic brain injury follow-up

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
12.1 Parenting behavior	1	113	Std. Mean Difference (IV, Random, 95% CI)	-0.34 [-0.72, 0.03]
12.2 Parent mental health	1	113	Std. Mean Difference (IV, Random, 95% CI)	-0.08 [-0.45, 0.29]
12.3 Child behavior/disability	1	105	Std. Mean Difference (IV, Random, 95% CI)	0.04 [-0.35, 0.42]
12.4 Child mental health	1	98	Std. Mean Difference (IV, Random, 95% CI)	-0.12 [-0.52, 0.28]
12.5 Family functioning	1	101	Std. Mean Difference (IV, Random, 95% CI)	-0.17 [-0.56, 0.23]

Analysis 12.1. Comparison 12: Traumatic brain injury follow-up, Outcome 1: Parenting behavior

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Wade 2014	-90.5	9.4	52	-87	10.7	61	100.0%	-0.34 [-0.72 , 0.03]
Total (95% CI)			**52**			**61**	**100.0%**	**-0.34 [-0.72 , 0.03]**

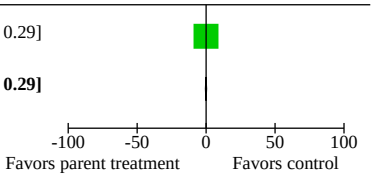
Heterogeneity: Not applicable
Test for overall effect: Z = 1.81 (P = 0.07)
Test for subgroup differences: Not applicable



Analysis 12.2. Comparison 12: Traumatic brain injury follow-up, Outcome 2: Parent mental health

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Wade 2014	11.9	11.7	52	12.8	11.8	61	100.0%	-0.08 [-0.45 , 0.29]
Total (95% CI)			**52**			**61**	**100.0%**	**-0.08 [-0.45 , 0.29]**

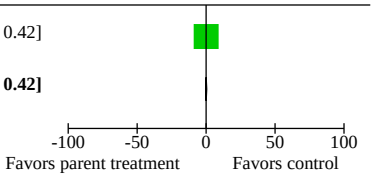
Heterogeneity: Not applicable
Test for overall effect: Z = 0.40 (P = 0.69)
Test for subgroup differences: Not applicable



Analysis 12.3. Comparison 12: Traumatic brain injury follow-up, Outcome 3: Child behavior/disability

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Wade 2014	46.4	49.68	50	44.73	40.77	55	100.0%	0.04 [-0.35 , 0.42]
Total (95% CI)			**50**			**55**	**100.0%**	**0.04 [-0.35 , 0.42]**

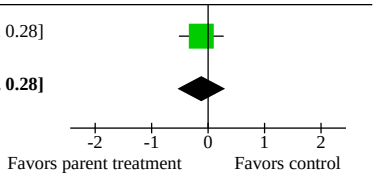
Heterogeneity: Not applicable
Test for overall effect: Z = 0.19 (P = 0.85)
Test for subgroup differences: Not applicable



Analysis 12.4. Comparison 12: Traumatic brain injury follow-up, Outcome 4: Child mental health

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Wade 2014	50.83	12.5	48	52.34	12.32	50	100.0%	-0.12 [-0.52 , 0.28]
Total (95% CI)			**48**			**50**	**100.0%**	**-0.12 [-0.52 , 0.28]**

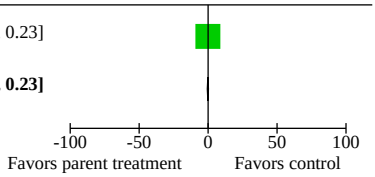
Heterogeneity: Not applicable
Test for overall effect: Z = 0.60 (P = 0.55)
Test for subgroup differences: Not applicable



Analysis 12.5. Comparison 12: Traumatic brain injury follow-up, Outcome 5: Family functioning

Study or Subgroup	Parent Treatment Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Wade 2014	1.95	0.37	49	2.02	0.46	52	100.0%	-0.17 [-0.56 , 0.23]
Total (95% CI)			**49**			**52**	**100.0%**	**-0.17 [-0.56 , 0.23]**

Heterogeneity: Not applicable
Test for overall effect: Z = 0.83 (P = 0.41)
Test for subgroup differences: Not applicable



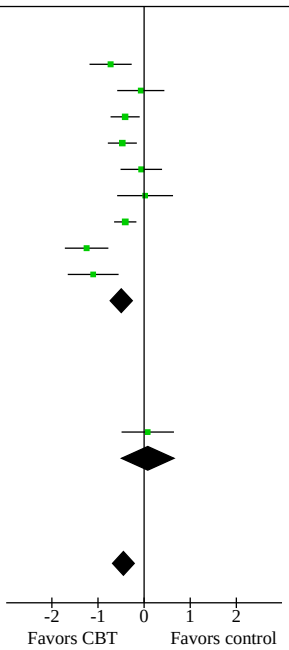
Comparison 13. Cognitive-behavioral therapy post-treatment

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
13.1 Parenting behavior	9	1040	Std. Mean Difference (IV, Random, 95% CI)	-0.45 [-0.68, -0.21]
13.1.1 Active control	8	992	Std. Mean Difference (IV, Random, 95% CI)	-0.50 [-0.74, -0.26]
13.1.2 Waitlist control	1	48	Std. Mean Difference (IV, Random, 95% CI)	0.08 [-0.49, 0.65]
13.2 Parent mental health	8	811	Std. Mean Difference (IV, Random, 95% CI)	-0.19 [-0.41, 0.03]
13.2.1 Active control	8	811	Std. Mean Difference (IV, Random, 95% CI)	-0.19 [-0.41, 0.03]
13.3 Child behavior/disability	10	1236	Std. Mean Difference (IV, Random, 95% CI)	-0.22 [-0.35, -0.08]
13.3.1 Active control	8	1093	Std. Mean Difference (IV, Random, 95% CI)	-0.18 [-0.31, -0.05]
13.3.2 Waitlist control	2	143	Std. Mean Difference (IV, Random, 95% CI)	-0.47 [-0.97, 0.04]
13.4 Child mental health	15	1786	Std. Mean Difference (IV, Random, 95% CI)	-0.08 [-0.19, 0.03]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
13.4.1 Active control	13	1637	Std. Mean Difference (IV, Random, 95% CI)	-0.09 [-0.21, 0.02]
13.4.2 Waitlist control	2	149	Std. Mean Difference (IV, Random, 95% CI)	0.06 [-0.27, 0.38]
13.5 Child symptoms	13	1434	Std. Mean Difference (IV, Random, 95% CI)	-0.38 [-0.71, -0.06]
13.5.1 Active control	11	1291	Std. Mean Difference (IV, Random, 95% CI)	-0.15 [-0.32, 0.02]
13.5.2 Waitlist control	2	143	Std. Mean Difference (IV, Random, 95% CI)	-1.70 [-3.94, 0.55]
13.6 Family functioning	5	429	Std. Mean Difference (IV, Random, 95% CI)	-0.11 [-0.35, 0.13]

Analysis 13.1. Comparison 13: Cognitive-behavioral therapy post-treatment, Outcome 1: Parenting behavior

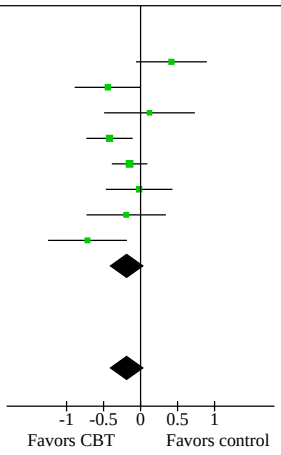
Study or Subgroup	CBT Mean	CBT SD	CBT Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
13.1.1 Active control								
Doherty 2013	2.61	0.64	42	3.13	0.78	37	9.8%	-0.73 [-1.18 , -0.27]
Law 2015	1.4	0.52	31	1.44	0.58	28	9.0%	-0.07 [-0.58 , 0.44]
Levy 2016	1.42	0.48	75	1.61	0.44	83	12.1%	-0.41 [-0.73 , -0.10]
Levy 2017	0.62	0.98	80	1.04	0.78	80	12.2%	-0.47 [-0.79 , -0.16]
Morawska 2016 (1)	-8.01	1.26	34	-7.93	1.33	43	9.9%	-0.06 [-0.51 , 0.39]
Morawska 2016 (2)	-136.7	33.64	20	-137.3	20.13	22	7.6%	0.02 [-0.58 , 0.63]
Palermo 2016b	1.05	0.57	134	1.29	0.6	135	13.3%	-0.41 [-0.65 , -0.17]
Wade 2017	-8.95	7.2	57	-1.5	2.2	32	9.6%	-1.25 [-1.72 , -0.77]
Westrupp 2015	2.13	0.65	28	2.84	0.62	31	8.4%	-1.10 [-1.66 , -0.55]
Subtotal (95% CI)			**501**			**491**	**91.9%**	**-0.50 [-0.74 , -0.26]**
Heterogeneity: Tau² = 0.09; Chi² = 25.12, df = 8 (P = 0.001); I² = 68%								
Test for overall effect: Z = 4.05 (P < 0.0001)								
13.1.2 Waitlist control								
Palermo 2009	19.91	9.76	26	19.11	10.15	22	8.1%	0.08 [-0.49 , 0.65]
Subtotal (95% CI)			**26**			**22**	**8.1%**	**0.08 [-0.49 , 0.65]**
Heterogeneity: Not applicable								
Test for overall effect: Z = 0.27 (P = 0.78)								
Total (95% CI)			**527**			**513**	**100.0%**	**-0.45 [-0.68 , -0.21]**
Heterogeneity: Tau² = 0.09; Chi² = 28.60, df = 9 (P = 0.0008); I² = 69%								
Test for overall effect: Z = 3.74 (P = 0.0002)								
Test for subgroup differences: Chi² = 3.34, df = 1 (P = 0.07), I² = 70.1%								



Footnotes
(1) Eczema sample
(2) Asthma sample

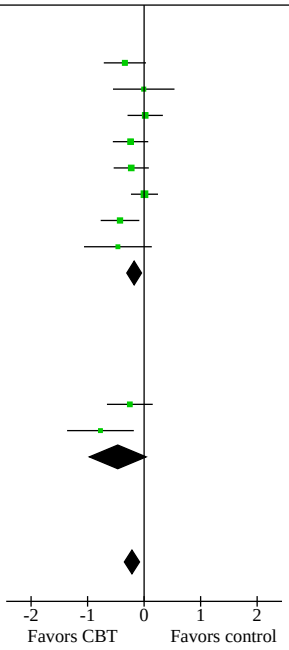
Analysis 13.2. Comparison 13: Cognitive-behavioral therapy post-treatment, Outcome 2: Parent mental health

Study or Subgroup	CBT Mean	CBT SD	CBT Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
13.2.1 Active control								
Ambrosino 2008	12.62	8.39	47	9.3	6.9	27	11.4%	0.42 [-0.06 , 0.89]
Doherty 2013	175.69	63.27	42	203.19	59.33	37	12.2%	-0.44 [-0.89 , 0.00]
Hoekstra-Weebers 1998	46.9	10.7	20	45.4	13.5	21	8.4%	0.12 [-0.49 , 0.73]
Levy 2017	5.34	13.29	80	10.68	11.99	80	16.5%	-0.42 [-0.73 , -0.11]
Palermo 2016b	10.22	5.96	134	11.15	6.48	135	19.3%	-0.15 [-0.39 , 0.09]
Stehl 2009	42.05	15.54	38	42.35	15.22	38	12.1%	-0.02 [-0.47 , 0.43]
Tsitsi 2017	11.7	8.15	29	13.33	8.38	25	10.0%	-0.19 [-0.73 , 0.34]
Westrupp 2015	1.17	2.21	28	4.57	6.14	30	10.1%	-0.72 [-1.25 , -0.18]
Subtotal (95% CI)			**418**			**393**	**100.0%**	**-0.19 [-0.41 , 0.03]**
Heterogeneity: Tau² = 0.05; Chi² = 14.88, df = 7 (P = 0.04); I² = 53%								
Test for overall effect: Z = 1.70 (P = 0.09)								
Total (95% CI)			**418**			**393**	**100.0%**	**-0.19 [-0.41 , 0.03]**
Heterogeneity: Tau² = 0.05; Chi² = 14.88, df = 7 (P = 0.04); I² = 53%								
Test for overall effect: Z = 1.70 (P = 0.09)								
Test for subgroup differences: Not applicable								



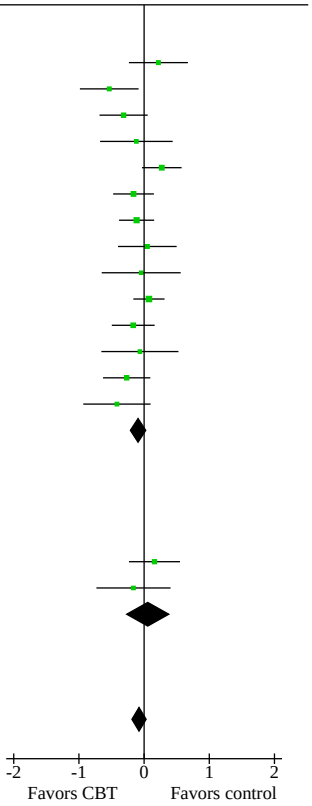
Analysis 13.3. Comparison 13: Cognitive-behavioral therapy post-treatment, Outcome 3: Child behavior/disability

Study or Subgroup	CBT Mean	CBT SD	CBT Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
13.3.1 Active control								
Kashikar-Zuck 2012	16.7	8.7	57	19.8	9.4	55	9.8%	-0.34 [-0.71 , 0.03]
Law 2015	4.83	4.78	20	4.86	4.4	37	5.3%	-0.01 [-0.55 , 0.54]
Levy 2010	0.56	0.54	83	0.55	0.48	75	12.7%	0.02 [-0.29 , 0.33]
Levy 2016	5.6	5.7	80	7.3	8.2	78	12.7%	-0.24 [-0.55 , 0.07]
Levy 2017	5.51	8.14	80	7.65	10.44	80	12.8%	-0.23 [-0.54 , 0.08]
Palermo 2016b	5.68	4.38	134	5.65	4.69	135	17.8%	0.01 [-0.23 , 0.25]
Powers 2013	15.5	17.4	64	29.6	42.2	71	11.2%	-0.43 [-0.77 , -0.08]
Sanders 1994	2.39	7.15	22	7.56	13.74	22	4.5%	-0.46 [-1.06 , 0.14]
Subtotal (95% CI)			**540**			**553**	**86.8%**	**-0.18 [-0.31 , -0.05]**
Heterogeneity: Tau² = 0.00; Chi² = 8.07, df = 7 (P = 0.33); I² = 13%								
Test for overall effect: Z = 2.65 (P = 0.008)								
13.3.2 Waitlist control								
Bonnert 2017	1.04	1.05	44	1.31	1.07	51	8.6%	-0.25 [-0.66 , 0.15]
Palermo 2009	3.6	2.86	26	6.62	4.76	22	4.6%	-0.77 [-1.36 , -0.18]
Subtotal (95% CI)			**70**			**73**	**13.2%**	**-0.47 [-0.97 , 0.04]**
Heterogeneity: Tau² = 0.07; Chi² = 2.03, df = 1 (P = 0.15); I² = 51%								
Test for overall effect: Z = 1.82 (P = 0.07)								
Total (95% CI)			**610**			**626**	**100.0%**	**-0.22 [-0.35 , -0.08]**
Heterogeneity: Tau² = 0.01; Chi² = 11.99, df = 9 (P = 0.21); I² = 25%								
Test for overall effect: Z = 3.15 (P = 0.002)								
Test for subgroup differences: Chi² = 1.21, df = 1 (P = 0.27), I² = 17.0%								



Analysis 13.4. Comparison 13: Cognitive-behavioral therapy post-treatment, Outcome 4: Child mental health

Study or Subgroup	CBT Mean	CBT SD	CBT Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
13.4.1 Active control								
Ambrosino 2008	5.39	5.72	51	4.1	6	30	4.9%	0.22 [-0.23 , 0.67]
Doherty 2013	82.24	29.93	42	100.51	37.79	37	4.9%	-0.53 [-0.98 , -0.08]
Kashikar-Zuck 2012	9.9	6.2	57	11.8	5.8	57	6.8%	-0.31 [-0.68 , 0.06]
Law 2015	46.3	10.03	27	47.48	9.5	23	3.4%	-0.12 [-0.68 , 0.44]
Levy 2010	9.97	6.16	84	8.35	5.73	84	9.1%	0.27 [-0.03 , 0.57]
Levy 2016	7.6	7.1	80	8.8	7.6	78	8.7%	-0.16 [-0.47 , 0.15]
Levy 2017	1.09	1.88	154	1.28	1.07	81	10.7%	-0.11 [-0.38 , 0.15]
Morawska 2016 (1)	78.62	28.61	34	77.19	28.6	43	4.9%	0.05 [-0.40 , 0.50]
Morawska 2016 (2)	47.3	28.23	20	48.5	24.64	22	2.9%	-0.04 [-0.65 , 0.56]
Palermo 2016b	9.71	5.1	134	9.32	5.37	135	12.4%	0.07 [-0.16 , 0.31]
Powers 2013	4.6	5.6	71	5.56	5.83	72	8.1%	-0.17 [-0.50 , 0.16]
Sanders 1994	57.5	11.5	22	58.1	5.8	22	3.0%	-0.06 [-0.66 , 0.53]
Wade 2017	49.37	12.13	57	52.56	11.6	61	7.0%	-0.27 [-0.63 , 0.10]
Westrupp 2015	47.31	8.27	29	51.5	11.28	30	3.9%	-0.42 [-0.93 , 0.10]
Subtotal (95% CI)			**862**			**775**	**90.6%**	**-0.09 [-0.21 , 0.02]**
Heterogeneity: Tau² = 0.01; Chi² = 17.49, df = 13 (P = 0.18); I² = 26%								
Test for overall effect: Z = 1.55 (P = 0.12)								
13.4.2 Waitlist control								
Bonnert 2017	25.23	16.23	47	22.62	16.31	54	6.2%	0.16 [-0.23 , 0.55]
Palermo 2009	58.96	13.1	26	61.59	18.67	22	3.3%	-0.16 [-0.73 , 0.41]
Subtotal (95% CI)			**73**			**76**	**9.4%**	**0.06 [-0.27 , 0.38]**
Heterogeneity: Tau² = 0.00; Chi² = 0.84, df = 1 (P = 0.36); I² = 0%								
Test for overall effect: Z = 0.34 (P = 0.74)								
Total (95% CI)			**935**			**851**	**100.0%**	**-0.08 [-0.19 , 0.03]**
Heterogeneity: Tau² = 0.01; Chi² = 18.96, df = 15 (P = 0.22); I² = 21%								
Test for overall effect: Z = 1.41 (P = 0.16)								
Test for subgroup differences: Chi² = 0.72, df = 1 (P = 0.40), I² = 0%								



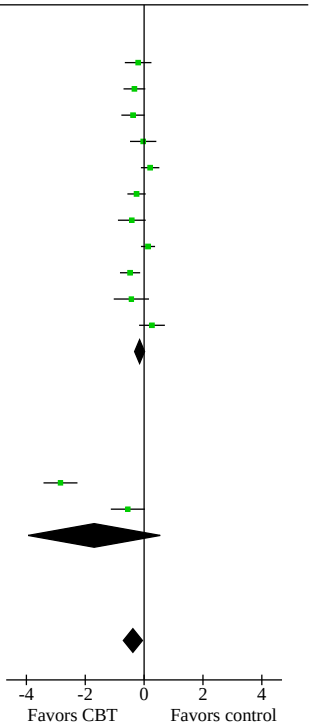
Footnotes

(1) Eczema group

(2) Asthma group

Analysis 13.5. Comparison 13: Cognitive-behavioral therapy post-treatment, Outcome 5: Child symptoms

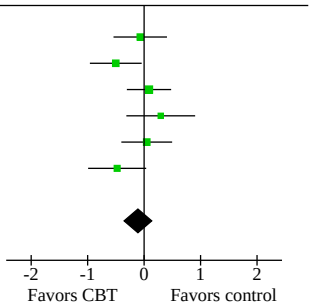
Study or Subgroup	CBT Mean	CBT SD	CBT Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
13.5.1 Active control								
Ambrosino 2008	7.04	1.29	51	7.3	1.23	30	7.6%	-0.20 [-0.66 , 0.25]
Kashikar-Zuck 2012	5.3	2.3	57	6	1.9	57	8.0%	-0.33 [-0.70 , 0.04]
Laffel 2003	8.2	1.1	50	8.7	1.5	50	7.9%	-0.38 [-0.77 , 0.02]
Law 2015	4.63	2.14	40	4.7	2.23	37	7.6%	-0.03 [-0.48 , 0.42]
Levy 2010	1.64	2.02	83	1.25	1.75	75	8.2%	0.20 [-0.11 , 0.52]
Levy 2017	3.99	2.22	80	4.57	2.28	80	8.2%	-0.26 [-0.57 , 0.05]
Morawska 2016 (1)	10.97	6.12	31	13.52	5.99	41	7.5%	-0.42 [-0.89 , 0.05]
Palermo 2016b	5.87	2.05	134	5.59	2.15	135	8.5%	0.13 [-0.11 , 0.37]
Powers 2013	9.8	9.8	64	14.5	9.8	71	8.1%	-0.48 [-0.82 , -0.13]
Sanders 1994	3.27	8.33	22	6.67	7.04	22	6.8%	-0.43 [-1.03 , 0.17]
Westrupp 2015	7.94	0.85	41	7.71	0.85	40	7.7%	0.27 [-0.17 , 0.71]
Subtotal (95% CI)			**653**			**638**	**86.1%**	**-0.15 [-0.32 , 0.02]**
Heterogeneity: Tau² = 0.04; Chi² = 22.06, df = 10 (P = 0.01); I² = 55%								
Test for overall effect: Z = 1.78 (P = 0.08)								
13.5.2 Waitlist control								
Bonnert 2017	4.53	0.37	44	5.53	0.33	51	6.9%	-2.84 [-3.42 , -2.26]
Palermo 2009	3.54	2.42	26	4.76	1.84	22	6.9%	-0.55 [-1.13 , 0.03]
Subtotal (95% CI)			**70**			**73**	**13.9%**	**-1.70 [-3.94 , 0.55]**
Heterogeneity: Tau² = 2.53; Chi² = 30.12, df = 1 (P < 0.00001); I² = 97%								
Test for overall effect: Z = 1.48 (P = 0.14)								
Total (95% CI)			**723**			**711**	**100.0%**	**-0.38 [-0.71 , -0.06]**
Heterogeneity: Tau² = 0.31; Chi² = 105.74, df = 12 (P < 0.00001); I² = 89%								
Test for overall effect: Z = 2.31 (P = 0.02)								
Test for subgroup differences: Chi² = 1.81, df = 1 (P = 0.18), I² = 44.7%								



Footnotes
(1) Eczema sample

Analysis 13.6. Comparison 13: Cognitive-behavioral therapy post-treatment, Outcome 6: Family functioning

Study or Subgroup	CBT Mean	CBT SD	CBT Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
Ambrosino 2008	-67.22	7.35	47	-66.71	7.39	27	16.8%	-0.07 [-0.54 , 0.40]
Doherty 2013	23.66	4.33	41	25.97	4.81	35	17.5%	-0.50 [-0.96 , -0.04]
Laffel 2003	3.1	3.9	50	2.8	2.9	50	20.9%	0.09 [-0.31 , 0.48]
Morawska 2016 (1)	-61.56	36.01	20	-70.45	22.22	22	11.9%	0.29 [-0.31 , 0.90]
Morawska 2016 (2)	-61.95	25.89	34	-63.01	19.43	43	17.9%	0.05 [-0.40 , 0.50]
Westrupp 2015	21.38	2.43	29	22.8	3.34	31	15.1%	-0.48 [-0.99 , 0.04]
Total (95% CI)			**221**			**208**	**100.0%**	**-0.11 [-0.35 , 0.13]**
Heterogeneity: Tau² = 0.03; Chi² = 7.92, df = 5 (P = 0.16); I² = 37%								
Test for overall effect: Z = 0.88 (P = 0.38)								
Test for subgroup differences: Not applicable								



Footnotes
(1) Asthma sample
(2) Eczema sample

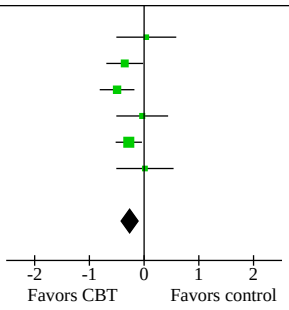
Comparison 14. Cognitive-behavioral therapy follow-up

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
14.1 Parenting behavior	6	743	Std. Mean Difference (IV, Random, 95% CI)	-0.26 [-0.42, -0.11]
14.2 Parent mental health	5	592	Std. Mean Difference (IV, Random, 95% CI)	-0.07 [-0.34, 0.20]
14.3 Child behavior/disability	8	1038	Std. Mean Difference (IV, Random, 95% CI)	-0.28 [-0.40, -0.15]
14.4 Child mental health	10	1244	Std. Mean Difference (IV, Random, 95% CI)	-0.07 [-0.19, 0.04]
14.5 Child symptoms	10	1136	Std. Mean Difference (IV, Random, 95% CI)	-0.13 [-0.32, 0.06]
14.6 Family functioning	3	201	Std. Mean Difference (IV, Random, 95% CI)	-0.04 [-0.32, 0.24]

Analysis 14.1. Comparison 14: Cognitive-behavioral therapy follow-up, Outcome 1: Parenting behavior

Study or Subgroup	CBT Mean	CBT SD	CBT Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
Law 2015	1.36	0.39	29	1.34	0.59	23	7.7%	0.04 [-0.51 , 0.59]
Levy 2016	1.31	0.48	68	1.49	0.53	70	19.0%	-0.35 [-0.69 , -0.02]
Levy 2017	0.54	0.48	76	0.84	0.7	82	21.1%	-0.49 [-0.81 , -0.18]
Morawska 2016 (1)	-8.06	1.7	32	-8.01	1.16	37	10.1%	-0.03 [-0.51 , 0.44]
Palermo 2016b	1	0.58	134	1.17	0.63	135	33.8%	-0.28 [-0.52 , -0.04]
Westrupp 2015	2.53	0.69	32	2.52	0.59	25	8.4%	0.02 [-0.51 , 0.54]
Total (95% CI)			**371**			**372**	**100.0%**	**-0.26 [-0.42 , -0.11]**

Heterogeneity: Tau² = 0.00; Chi² = 5.49, df = 5 (P = 0.36); I² = 9%
Test for overall effect: Z = 3.35 (P = 0.0008)
Test for subgroup differences: Not applicable

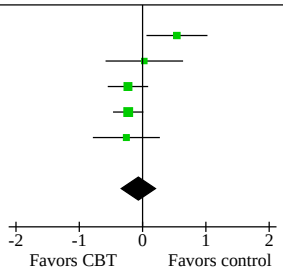


Footnotes
(1) Eczema sample

Analysis 14.2. Comparison 14: Cognitive-behavioral therapy follow-up, Outcome 2: Parent mental health

Study or Subgroup	CBT Mean	CBT SD	CBT Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
Ambrosino 2008	12.6	7.91	47	8.74	5.12	27	17.3%	0.54 [0.06 , 1.02]
Hoekstra-Weebers 1998	41.9	10.9	20	41.6	10.4	21	12.9%	0.03 [-0.58 , 0.64]
Levy 2017	5.43	9.25	74	7.69	10.17	78	24.9%	-0.23 [-0.55 , 0.09]
Palermo 2016b	9.47	5.87	134	10.85	6.25	135	29.4%	-0.23 [-0.47 , 0.01]
Westrupp 2015	2.12	3.11	31	2.96	3.38	25	15.5%	-0.26 [-0.79 , 0.27]
Total (95% CI)			**306**			**286**	**100.0%**	**-0.07 [-0.34 , 0.20]**

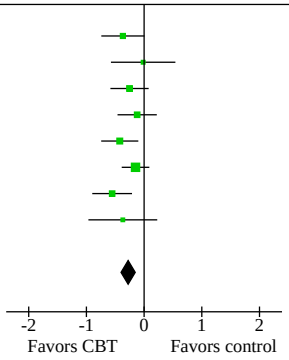
Heterogeneity: Tau² = 0.05; Chi² = 8.98, df = 4 (P = 0.06); I² = 55%
Test for overall effect: Z = 0.48 (P = 0.63)
Test for subgroup differences: Not applicable



Analysis 14.3. Comparison 14: Cognitive-behavioral therapy follow-up, Outcome 3: Child behavior/disability

Study or Subgroup	CBT Mean	CBT SD	CBT Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
Kashikar-Zuck 2012	13.4	8.9	57	17	10.5	55	10.8%	-0.37 [-0.74 , 0.01]
Law 2015	5.19	5.02	28	5.27	4.61	22	4.8%	-0.02 [-0.57 , 0.54]
Levy 2010	0.36	0.39	80	0.48	0.56	63	13.7%	-0.25 [-0.58 , 0.08]
Levy 2016	5.1	6.4	67	5.9	6.8	66	13.0%	-0.12 [-0.46 , 0.22]
Levy 2017	4.51	6.64	74	7.6	7.85	78	14.5%	-0.42 [-0.74 , -0.10]
Palermo 2016b	5.46	4.32	134	6.16	5.04	135	26.3%	-0.15 [-0.39 , 0.09]
Powers 2013	7.1	14.4	64	21.8	33.7	71	12.7%	-0.55 [-0.90 , -0.21]
Sanders 1994	2.28	5.96	22	5.57	10.86	22	4.2%	-0.37 [-0.97 , 0.23]
Total (95% CI)			**526**			**512**	**100.0%**	**-0.28 [-0.40 , -0.15]**

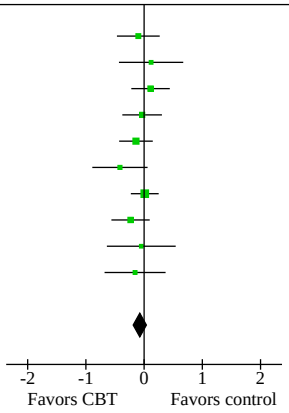
Heterogeneity: Tau² = 0.00; Chi² = 6.36, df = 7 (P = 0.50); I² = 0%
Test for overall effect: Z = 4.43 (P < 0.00001)
Test for subgroup differences: Not applicable



Analysis 14.4. Comparison 14: Cognitive-behavioral therapy follow-up, Outcome 4: Child mental health

Study or Subgroup	CBT Mean	CBT SD	CBT Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
Kashikar-Zuck 2012	8.7	6.1	57	9.3	5.9	57	9.5%	-0.10 [-0.47 , 0.27]
Law 2015	44.75	9.52	28	43.74	6.45	23	4.2%	0.12 [-0.43 , 0.67]
Levy 2010	7.89	6.99	80	7.19	5.27	63	11.7%	0.11 [-0.22 , 0.44]
Levy 2016	4.4	5.8	67	4.6	5.9	66	11.1%	-0.03 [-0.37 , 0.31]
Levy 2017	0.88	1.76	154	1.1	0.97	66	15.3%	-0.14 [-0.43 , 0.15]
Morawska 2016 (1)	63.78	24.99	33	74.68	26.81	37	5.7%	-0.42 [-0.89 , 0.06]
Palermo 2016b	9.55	5.13	134	9.49	5.58	135	22.4%	0.01 [-0.23 , 0.25]
Powers 2013	2.85	4.9	71	4.07	5.51	72	11.8%	-0.23 [-0.56 , 0.10]
Sanders 1994	58.1	12.2	22	58.6	7.5	22	3.7%	-0.05 [-0.64 , 0.54]
Westrupp 2015	48.16	10.55	32	50.16	15.04	25	4.7%	-0.16 [-0.68 , 0.37]
Total (95% CI)			**678**			**566**	**100.0%**	**-0.07 [-0.19 , 0.04]**

Heterogeneity: Tau² = 0.00; Chi² = 5.41, df = 9 (P = 0.80); I² = 0%
Test for overall effect: Z = 1.29 (P = 0.20)
Test for subgroup differences: Not applicable

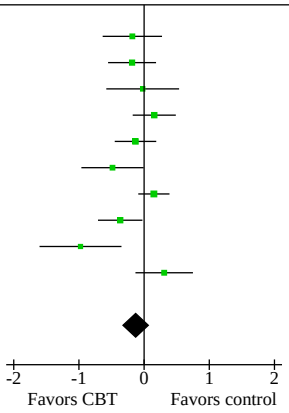


Footnotes
(1) Eczema group

Analysis 14.5. Comparison 14: Cognitive-behavioral therapy follow-up, Outcome 5: Child symptoms

Study or Subgroup	CBT Mean	CBT SD	CBT Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
Ambrosino 2008	7.19	1.03	49	7.39	1.2	30	9.0%	-0.18 [-0.64 , 0.27]
Kashikar-Zuck 2012	4.9	2.2	57	5.3	2.1	57	10.8%	-0.18 [-0.55 , 0.18]
Law 2015	3.86	2.19	28	3.91	2.39	22	7.2%	-0.02 [-0.58 , 0.54]
Levy 2010	0.93	1.42	80	0.7	1.53	63	11.7%	0.16 [-0.17 , 0.49]
Levy 2017	3.47	2.33	74	3.79	2.48	78	12.0%	-0.13 [-0.45 , 0.19]
Morawska 2016 (1)	9.31	6.03	32	12.11	5.43	38	8.5%	-0.48 [-0.96 , -0.01]
Palermo 2016b	5.85	1.97	134	5.55	2.02	135	13.9%	0.15 [-0.09 , 0.39]
Powers 2013	7.5	9	64	11.1	10.4	71	11.4%	-0.37 [-0.71 , -0.03]
Sanders 1994	0.36	0.77	22	3.97	5.08	22	6.2%	-0.98 [-1.60 , -0.35]
Westrupp 2015	7.9	1.04	40	7.59	0.95	40	9.2%	0.31 [-0.13 , 0.75]
Total (95% CI)			**580**			**556**	**100.0%**	**-0.13 [-0.32 , 0.06]**

Heterogeneity: Tau² = 0.06; Chi² = 22.41, df = 9 (P = 0.008); I² = 60%
Test for overall effect: Z = 1.31 (P = 0.19)
Test for subgroup differences: Not applicable

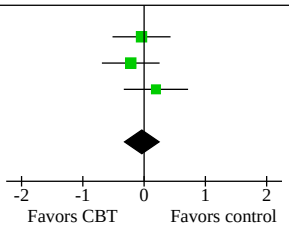


Footnotes
(1) Eczema sample

Analysis 14.6. Comparison 14: Cognitive-behavioral therapy follow-up, Outcome 6: Family functioning

Study or Subgroup	CBT Mean	CBT SD	CBT Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
Ambrosino 2008	-66.02	6.94	47	-65.71	7.86	27	35.4%	-0.04 [-0.52 , 0.43]
Morawska 2016 (1)	-64.96	20.05	33	-60.05	24.05	37	35.8%	-0.22 [-0.69 , 0.25]
Westrupp 2015	23.44	5.24	32	22.56	3.29	25	28.8%	0.19 [-0.33 , 0.72]
Total (95% CI)			**112**			**89**	**100.0%**	**-0.04 [-0.32 , 0.24]**

Heterogeneity: Tau² = 0.00; Chi² = 1.31, df = 2 (P = 0.52); I² = 0%
Test for overall effect: Z = 0.26 (P = 0.80)
Test for subgroup differences: Not applicable



Footnotes
(1) Eczema sample

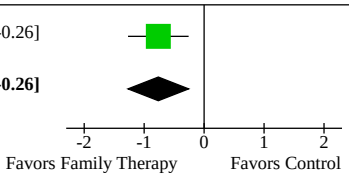
Comparison 15. Family therapy post-treatment

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
15.1 Parent mental health	1	65	Std. Mean Difference (IV, Random, 95% CI)	-0.76 [-1.27, -0.26]
15.2 Child mental health	1	74	Mean Difference (IV, Fixed, 95% CI)	3.40 [-1.63, 8.43]
15.3 Child symptoms	3	197	Std. Mean Difference (IV, Random, 95% CI)	-0.18 [-0.77, 0.40]
15.4 Family functioning	3	197	Std. Mean Difference (IV, Random, 95% CI)	-0.34 [-0.89, 0.21]

Analysis 15.1. Comparison 15: Family therapy post-treatment, Outcome 1: Parent mental health

Study or Subgroup	Family Therapy Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Yeh 2016	202.12	25.93	34	222.03	25.57	31	100.0%	-0.76 [-1.27 , -0.26]
Total (95% CI)			**34**			**31**	**100.0%**	**-0.76 [-1.27 , -0.26]**

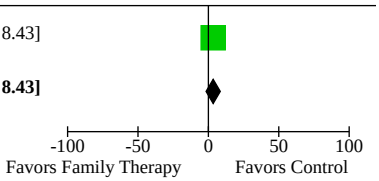
Heterogeneity: Not applicable
Test for overall effect: Z = 2.96 (P = 0.003)
Test for subgroup differences: Not applicable



Analysis 15.2. Comparison 15: Family therapy post-treatment, Outcome 2: Child mental health

Study or Subgroup	Family Therapy Mean	SD	Total	Control Mean	SD	Total	Weight	Mean Difference IV, Fixed, 95% CI
Wysocki 1999	-73.6	11.3	35	-77	10.7	39	100.0%	3.40 [-1.63 , 8.43]
Total (95% CI)			**35**			**39**	**100.0%**	**3.40 [-1.63 , 8.43]**

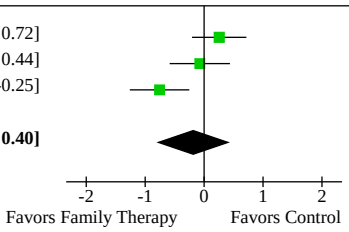
Heterogeneity: Not applicable
Test for overall effect: Z = 1.33 (P = 0.19)
Test for subgroup differences: Not applicable



Analysis 15.3. Comparison 15: Family therapy post-treatment, Outcome 3: Child symptoms

Study or Subgroup	Family Therapy Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Wysocki 1999	12.3	2.9	35	11.6	2.5	38	34.3%	0.26 [-0.20 , 0.72]
Wysocki 2006	8.8	1.5	28	8.9	1.2	31	32.7%	-0.07 [-0.58 , 0.44]
Yeh 2016	-1.47	0.46	34	-1.17	0.3	31	32.9%	-0.76 [-1.26 , -0.25]
Total (95% CI)			**97**			**100**	**100.0%**	**-0.18 [-0.77 , 0.40]**

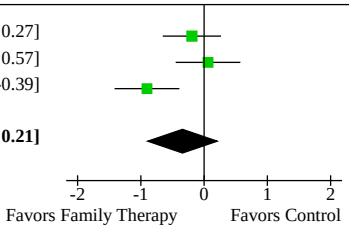
Heterogeneity: Tau² = 0.21; Chi² = 8.60, df = 2 (P = 0.01); I² = 77%
Test for overall effect: Z = 0.62 (P = 0.54)
Test for subgroup differences: Not applicable



Analysis 15.4. Comparison 15: Family therapy post-treatment, Outcome 4: Family functioning

Study or Subgroup	Family Therapy Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Wysocki 1999	50.2	6.7	35	51.4	5.6	38	34.6%	-0.19 [-0.65 , 0.27]
Wysocki 2006	50	6.7	28	49.6	6.1	31	32.7%	0.06 [-0.45 , 0.57]
Yeh 2016	-49.44	3.14	34	-44.68	6.79	31	32.7%	-0.90 [-1.42 , -0.39]
Total (95% CI)			**97**			**100**	**100.0%**	**-0.34 [-0.89 , 0.21]**

Heterogeneity: Tau² = 0.17; Chi² = 7.40, df = 2 (P = 0.02); I² = 73%
Test for overall effect: Z = 1.22 (P = 0.22)
Test for subgroup differences: Not applicable



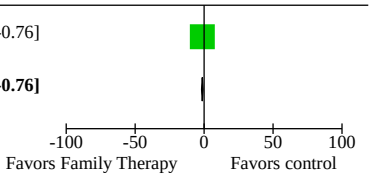
Comparison 16. Family therapy follow-up

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
16.1 Parent mental health	1	65	Std. Mean Difference (IV, Random, 95% CI)	-1.30 [-1.83, -0.76]
16.2 Child symptoms	2	124	Std. Mean Difference (IV, Random, 95% CI)	-0.48 [-1.12, 0.15]
16.3 Family functioning	1	65	Std. Mean Difference (IV, Random, 95% CI)	-2.71 [-3.39, -2.02]

Analysis 16.1. Comparison 16: Family therapy follow-up, Outcome 1: Parent mental health

Study or Subgroup	Family Therapy Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Yeh 2016	195.32	25.68	34	228.68	25.17	31	100.0%	-1.30 [-1.83 , -0.76]
Total (95% CI)			**34**			**31**	**100.0%**	**-1.30 [-1.83 , -0.76]**

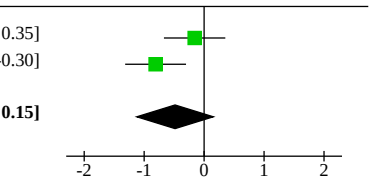
Heterogeneity: Not applicable
Test for overall effect: Z = 4.72 (P < 0.00001)
Test for subgroup differences: Not applicable



Analysis 16.2. Comparison 16: Family therapy follow-up, Outcome 2: Child symptoms

Study or Subgroup	Family Therapy Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Wysocki 2006	8.7	1.3	28	8.9	1.2	31	49.9%	-0.16 [-0.67 , 0.35]
Yeh 2016	-1.49	0.43	34	-1.19	0.28	31	50.1%	-0.81 [-1.32 , -0.30]
Total (95% CI)			**62**			**62**	**100.0%**	**-0.48 [-1.12 , 0.15]**

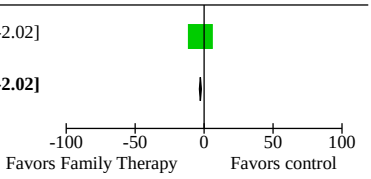
Heterogeneity: Tau² = 0.14; Chi² = 3.13, df = 1 (P = 0.08); I² = 68%
Test for overall effect: Z = 1.49 (P = 0.14)
Test for subgroup differences: Not applicable



Analysis 16.3. Comparison 16: Family therapy follow-up, Outcome 3: Family functioning

Study or Subgroup	Family Therapy Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Yeh 2016	-56.38	3.28	34	-43.32	5.99	31	100.0%	-2.71 [-3.39 , -2.02]
Total (95% CI)			**34**			**31**	**100.0%**	**-2.71 [-3.39 , -2.02]**

Heterogeneity: Not applicable
Test for overall effect: Z = 7.76 (P < 0.00001)
Test for subgroup differences: Not applicable



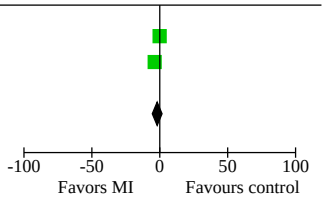
Comparison 17. Motivational interviewing post-treatment

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
17.1 Parenting behavior	2	143	Std. Mean Difference (IV, Random, 95% CI)	-1.92 [-5.50, 1.66]
17.2 Child symptoms	2	122	Std. Mean Difference (IV, Random, 95% CI)	-0.18 [-0.82, 0.46]
17.3 Family functioning	2	143	Std. Mean Difference (IV, Random, 95% CI)	-0.22 [-0.66, 0.21]

Analysis 17.1. Comparison 17: Motivational interviewing post-treatment, Outcome 1: Parenting behavior

	Motivational Interviewing			Control				Std. Mean Difference	Std. Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI	IV, Random, 95% CI
Ellis 2017a	-4.22	1.59	41	-4.08	0.68	23	50.3%	-0.10 [-0.61 , 0.41]	
May 2017	-7.85	0.3	39	-6.73	0.29	40	49.7%	-3.76 [-4.51 , -3.01]	
Total (95% CI)			**80**			**63**	**100.0%**	**-1.92 [-5.50 , 1.66]**	

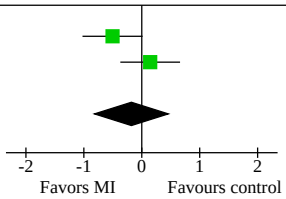
Heterogeneity: Tau² = 6.58; Chi² = 62.84, df = 1 (P < 0.00001); I² = 98%
Test for overall effect: Z = 1.05 (P = 0.29)
Test for subgroup differences: Not applicable



Analysis 17.2. Comparison 17: Motivational interviewing post-treatment, Outcome 2: Child symptoms

	Motivational Interviewing			Control				Std. Mean Difference	Std. Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI	IV, Random, 95% CI
Ellis 2017a	10.04	1.79	41	11.04	2.23	23	49.9%	-0.50 [-1.02 , 0.01]	
Mayer-Davis 2015	9.7	1.5	29	9.5	1.2	29	50.1%	0.15 [-0.37 , 0.66]	
Total (95% CI)			**70**			**52**	**100.0%**	**-0.18 [-0.82 , 0.46]**	

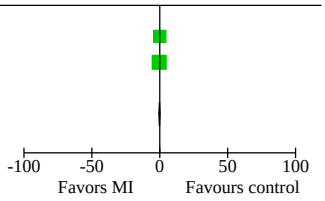
Heterogeneity: Tau² = 0.14; Chi² = 3.04, df = 1 (P = 0.08); I² = 67%
Test for overall effect: Z = 0.55 (P = 0.58)
Test for subgroup differences: Not applicable



Analysis 17.3. Comparison 17: Motivational interviewing post-treatment, Outcome 3: Family functioning

	Motivational Interviewing			Control				Std. Mean Difference	Std. Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI	IV, Random, 95% CI
Ellis 2017a	3.45	2.515	41	3.4	3.99	23	45.9%	0.02 [-0.49 , 0.53]	
May 2017	-5.24	0.26	39	-5.13	0.25	40	54.1%	-0.43 [-0.87 , 0.02]	
Total (95% CI)			**80**			**63**	**100.0%**	**-0.22 [-0.66 , 0.21]**	

Heterogeneity: Tau² = 0.04; Chi² = 1.64, df = 1 (P = 0.20); I² = 39%
Test for overall effect: Z = 1.01 (P = 0.31)
Test for subgroup differences: Not applicable



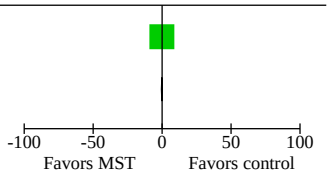
Comparison 18. Multisystemic therapy post-treatment

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
18.1 Parenting behavior	1	167	Std. Mean Difference (IV, Random, 95% CI)	-0.17 [-0.47, 0.14]
18.2 Child mental health	1	117	Std. Mean Difference (IV, Random, 95% CI)	-0.35 [-0.71, 0.02]
18.3 Child symptoms	4	477	Std. Mean Difference (IV, Random, 95% CI)	-0.18 [-0.45, 0.08]

Analysis 18.1. Comparison 18: Multisystemic therapy post-treatment, Outcome 1: Parenting behavior

	Multisystemic Therapy			Control				Std. Mean Difference	Std. Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI	IV, Random, 95% CI
Naar-King 2014	-7.91	1.6	84	-7.61	1.96	83	100.0%	-0.17 [-0.47 , 0.14]	
Total (95% CI)			**84**			**83**	**100.0%**	**-0.17 [-0.47 , 0.14]**	

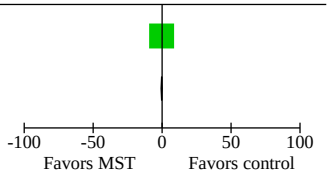
Heterogeneity: Not applicable
Test for overall effect: Z = 1.08 (P = 0.28)
Test for subgroup differences: Not applicable



Analysis 18.2. Comparison 18: Multisystemic therapy post-treatment, Outcome 2: Child mental health

	Multisystemic Therapy			Control				Std. Mean Difference	Std. Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI	IV, Random, 95% CI
Ellis 2005	51.9	29.8	59	61.8	26.7	58	100.0%	-0.35 [-0.71 , 0.02]	
Total (95% CI)			**59**			**58**	**100.0%**	**-0.35 [-0.71 , 0.02]**	

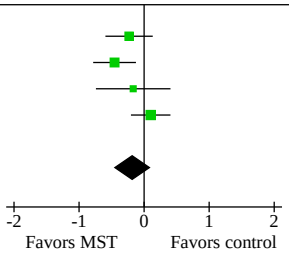
Heterogeneity: Not applicable
Test for overall effect: Z = 1.86 (P = 0.06)
Test for subgroup differences: Not applicable



Analysis 18.3. Comparison 18: Multisystemic therapy post-treatment, Outcome 3: Child symptoms

	Multisystemic Therapy			Control				Std. Mean Difference	Std. Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI	IV, Random, 95% CI
Ellis 2005	10.72	2.59	59	11.29	2.3	58	26.0%	-0.23 [-0.59 , 0.13]	
Ellis 2012	10.41	2.45	74	11.54	2.5	72	28.5%	-0.45 [-0.78 , -0.13]	
Ellis 2017b	11.03	2.1	23	11.39	2.12	24	15.1%	-0.17 [-0.74 , 0.41]	
Naar-King 2014	-2.24	0.6	84	-2.3	0.58	83	30.5%	0.10 [-0.20 , 0.40]	
Total (95% CI)			**240**			**237**	**100.0%**	**-0.18 [-0.45 , 0.08]**	

Heterogeneity: Tau² = 0.04; Chi² = 6.04, df = 3 (P = 0.11); I² = 50%
Test for overall effect: Z = 1.36 (P = 0.17)
Test for subgroup differences: Not applicable



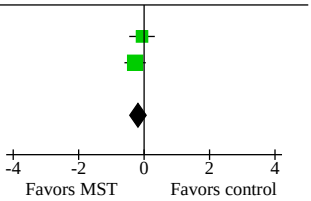
Comparison 19. Multisystemic therapy follow-up

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
19.1 Child symptoms	2	247	Std. Mean Difference (IV, Random, 95% CI)	-0.19 [-0.44, 0.06]

Analysis 19.1. Comparison 19: Multisystemic therapy follow-up, Outcome 1: Child symptoms

Study or Subgroup	Multisystemic Therapy Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Ellis 2005	10.95	2.62	49	11.12	2.67	52	41.1%	-0.06 [-0.45 , 0.33]
Ellis 2012	10.95	2.83	74	11.72	2.75	72	58.9%	-0.27 [-0.60 , 0.05]
Total (95% CI)			**123**			**124**	**100.0%**	**-0.19 [-0.44 , 0.06]**

Heterogeneity: Tau² = 0.00; Chi² = 0.66, df = 1 (P = 0.42); I² = 0%
Test for overall effect: Z = 1.47 (P = 0.14)
Test for subgroup differences: Not applicable



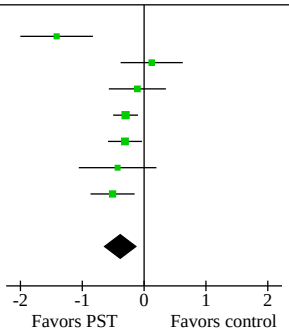
Comparison 20. Problem-solving therapy post-treatment

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
20.1 Parenting behavior	7	947	Std. Mean Difference (IV, Random, 95% CI)	-0.39 [-0.64, -0.13]
20.2 Parent mental health	6	891	Std. Mean Difference (IV, Random, 95% CI)	-0.30 [-0.45, -0.15]
20.3 Child behavior/disability	3	247	Std. Mean Difference (IV, Random, 95% CI)	0.08 [-0.18, 0.33]
20.4 Child mental health	4	276	Std. Mean Difference (IV, Random, 95% CI)	-0.12 [-0.50, 0.25]
20.5 Child symptoms	5	679	Std. Mean Difference (IV, Random, 95% CI)	0.25 [-0.23, 0.72]
20.6 Family functioning	2	237	Std. Mean Difference (IV, Random, 95% CI)	-0.15 [-0.41, 0.10]

Analysis 20.1. Comparison 20: Problem-solving therapy post-treatment, Outcome 1: Parenting behavior

Study or Subgroup	PST Mean	PST SD	PST Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
Husted 2014	-37	1.5	26	-35	1.3	31	10.4%	-1.41 [-2.00 , -0.83]
Palermo 2016a	21.93	5.02	31	21.15	7.33	30	12.2%	0.12 [-0.38 , 0.63]
Sahler 2002	-72.85	14.48	33	-71.32	13.49	40	13.2%	-0.11 [-0.57 , 0.35]
Sahler 2005	-14.33	2.54	189	-13.59	2.39	195	20.4%	-0.30 [-0.50 , -0.10]
Sahler 2013	-14.58	2.61	97	-13.74	2.78	110	18.3%	-0.31 [-0.58 , -0.04]
Wade 2006a	-73.45	9.61	20	-69.16	10.02	20	9.6%	-0.43 [-1.06 , 0.20]
Wade 2014	-91.9	7.2	61	-87.2	10.7	64	16.0%	-0.51 [-0.87 , -0.15]
Total (95% CI)			**457**			**490**	**100.0%**	**-0.39 [-0.64 , -0.13]**

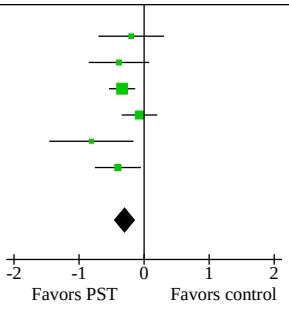
Heterogeneity: Tau² = 0.07; Chi² = 18.26, df = 6 (P = 0.006); I² = 67%
Test for overall effect: Z = 2.99 (P = 0.003)
Test for subgroup differences: Not applicable



Analysis 20.2. Comparison 20: Problem-solving therapy post-treatment, Outcome 2: Parent mental health

Study or Subgroup	PST Mean	PST SD	PST Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
Palermo 2016a	7.87	5.82	31	9.33	8.51	30	8.3%	-0.20 [-0.70 , 0.30]
Sahler 2002	80.76	38.81	33	98.1	48.5	40	9.6%	-0.39 [-0.85 , 0.08]
Sahler 2005	10.74	8.8	191	13.87	9.66	194	37.5%	-0.34 [-0.54 , -0.14]
Sahler 2013	12.14	10.4	97	12.86	9.66	110	24.0%	-0.07 [-0.34 , 0.20]
Wade 2006a	9.25	7.09	20	18.15	13.49	20	5.2%	-0.81 [-1.46 , -0.16]
Wade 2014	11.1	9.3	61	15.4	11.7	64	15.6%	-0.40 [-0.76 , -0.05]
Total (95% CI)			**433**			**458**	**100.0%**	**-0.30 [-0.45 , -0.15]**

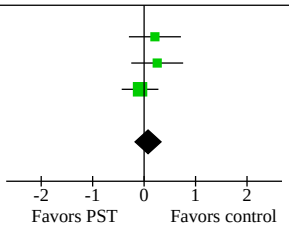
Heterogeneity: Tau² = 0.01; Chi² = 5.82, df = 5 (P = 0.32); I² = 14%
Test for overall effect: Z = 3.93 (P < 0.0001)
Test for subgroup differences: Not applicable



Analysis 20.3. Comparison 20: Problem-solving therapy post-treatment, Outcome 3: Child behavior/disability

Study or Subgroup	PST Mean	PST SD	PST Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
Daniel 2015	-60.4	23.89	24	-64.6	16.94	41	24.9%	0.21 [-0.30 , 0.72]
Palermo 2016a	9.52	6.47	31	8.1	4.28	30	25.0%	0.25 [-0.25 , 0.76]
Wade 2014	43	39.42	60	46.07	38.18	61	50.0%	-0.08 [-0.44 , 0.28]
Total (95% CI)			**115**			**132**	**100.0%**	**0.08 [-0.18 , 0.33]**

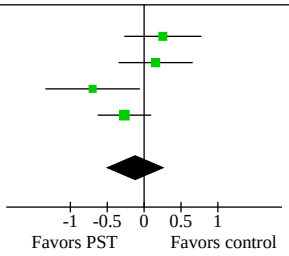
Heterogeneity: Tau² = 0.00; Chi² = 1.48, df = 2 (P = 0.48); I² = 0%
Test for overall effect: Z = 0.60 (P = 0.55)
Test for subgroup differences: Not applicable



Analysis 20.4. Comparison 20: Problem-solving therapy post-treatment, Outcome 4: Child mental health

Study or Subgroup	PST Mean	PST SD	PST Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
Husted 2014	-60	4.2	26	-61	3.6	31	24.0%	0.25 [-0.27 , 0.78]
Palermo 2016a	12.03	5.13	31	11.2	5.37	30	24.9%	0.16 [-0.35 , 0.66]
Wade 2006a	47.78	11.43	20	56.06	11.82	20	19.5%	-0.70 [-1.34 , -0.06]
Wade 2014	49.37	12.13	57	52.56	11.6	61	31.7%	-0.27 [-0.63 , 0.10]
Total (95% CI)			**134**			**142**	**100.0%**	**-0.12 [-0.50 , 0.25]**

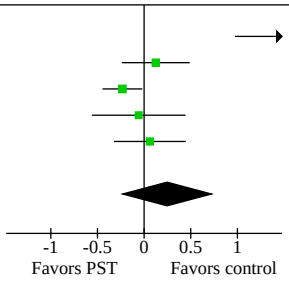
Heterogeneity: Tau² = 0.08; Chi² = 6.88, df = 3 (P = 0.08); I² = 56%
Test for overall effect: Z = 0.63 (P = 0.53)
Test for subgroup differences: Not applicable



Analysis 20.5. Comparison 20: Problem-solving therapy post-treatment, Outcome 5: Child symptoms

Study or Subgroup	PST Mean	PST SD	PST Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
Husted 2014	9.5	0.3	26	9.1	0.2	31	17.2%	1.58 [0.97 , 2.18]
Nansel 2009	8.8	1.9	58	8.6	1.2	58	20.8%	0.13 [-0.24 , 0.49]
Nansel 2012	8.78	1.37	172	9.11	1.46	168	22.6%	-0.23 [-0.45 , -0.02]
Palermo 2016a	5.58	2.03	31	5.7	2.05	30	18.8%	-0.06 [-0.56 , 0.44]
Seid 2010	-74.4	18.3	47	-75.5	16.9	58	20.5%	0.06 [-0.32 , 0.45]
Total (95% CI)			**334**			**345**	**100.0%**	**0.25 [-0.23 , 0.72]**

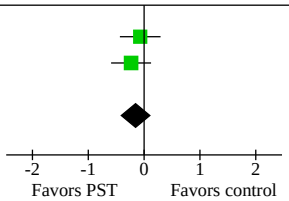
Heterogeneity: Tau² = 0.25; Chi² = 31.53, df = 4 (P < 0.00001); I² = 87%
Test for overall effect: Z = 1.01 (P = 0.31)
Test for subgroup differences: Not applicable



Analysis 20.6. Comparison 20: Problem-solving therapy post-treatment, Outcome 6: Family functioning

Study or Subgroup	PST Mean	PST SD	PST Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
Nansel 2009	25	8.3	58	25.6	8.8	58	49.1%	-0.07 [-0.43 , 0.29]
Wade 2014	1.87	0.41	58	1.97	0.44	63	50.9%	-0.23 [-0.59 , 0.12]
Total (95% CI)			**116**			**121**	**100.0%**	**-0.15 [-0.41 , 0.10]**

Heterogeneity: Tau² = 0.00; Chi² = 0.39, df = 1 (P = 0.53); I² = 0%
Test for overall effect: Z = 1.17 (P = 0.24)
Test for subgroup differences: Not applicable



Comparison 21. Problem-solving therapy follow-up

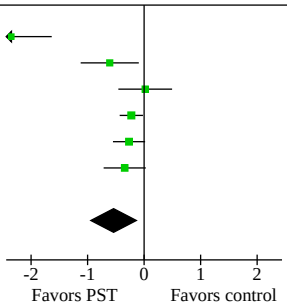
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
21.1 Parenting behavior	6	852	Std. Mean Difference (IV, Random, 95% CI)	-0.54 [-0.94, -0.14]
21.2 Parent mental health	5	800	Std. Mean Difference (IV, Random, 95% CI)	-0.21 [-0.35, -0.07]
21.3 Child behavior/disability	2	166	Std. Mean Difference (IV, Random, 95% CI)	-0.04 [-0.35, 0.26]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
21.4 Child mental health	3	212	Std. Mean Difference (IV, Random, 95% CI)	0.59 [-0.28, 1.46]
21.5 Child symptoms	3	210	Std. Mean Difference (IV, Random, 95% CI)	0.25 [-0.08, 0.59]
21.6 Family functioning	1	101	Std. Mean Difference (IV, Random, 95% CI)	-0.17 [-0.56, 0.23]

Analysis 21.1. Comparison 21: Problem-solving therapy follow-up, Outcome 1: Parenting behavior

Study or Subgroup	PST Mean	PST SD	PST Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
Husted 2014	-40	1.2	23	-37	1.3	30	12.5%	-2.35 [-3.06 , -1.63]
Palermo 2016a	18.32	5.98	31	21.98	5.9	30	15.5%	-0.61 [-1.12 , -0.09]
Sahler 2002	-73.01	13.9	34	-73.29	14.07	34	16.1%	0.02 [-0.46 , 0.50]
Sahler 2005	-14.26	2.55	179	-13.69	2.48	186	19.6%	-0.23 [-0.43 , -0.02]
Sahler 2013	-14.72	2.69	94	-14.02	2.54	98	18.8%	-0.27 [-0.55 , 0.02]
Wade 2014	-90.5	9.4	52	-87	10.7	61	17.6%	-0.34 [-0.72 , 0.03]
Total (95% CI)			**413**			**439**	**100.0%**	**-0.54 [-0.94 , -0.14]**

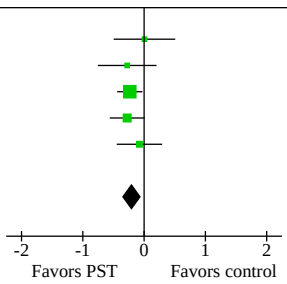
Heterogeneity: Tau² = 0.20; Chi² = 35.02, df = 5 (P < 0.00001); I² = 86%
Test for overall effect: Z = 2.63 (P = 0.009)
Test for subgroup differences: Not applicable



Analysis 21.2. Comparison 21: Problem-solving therapy follow-up, Outcome 2: Parent mental health

Study or Subgroup	PST Mean	PST SD	PST Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
Palermo 2016a	7.21	8.26	31	7.16	8.61	30	7.7%	0.01 [-0.50 , 0.51]
Sahler 2002	73.01	39.4	34	84.43	42.42	34	8.5%	-0.28 [-0.75 , 0.20]
Sahler 2005	10.32	8.5	180	12.36	8.92	186	45.8%	-0.23 [-0.44 , -0.03]
Sahler 2013	9.45	9.64	94	12.16	9.9	98	23.9%	-0.28 [-0.56 , 0.01]
Wade 2014	11.9	11.7	52	12.8	11.8	61	14.1%	-0.08 [-0.45 , 0.29]
Total (95% CI)			**391**			**409**	**100.0%**	**-0.21 [-0.35 , -0.07]**

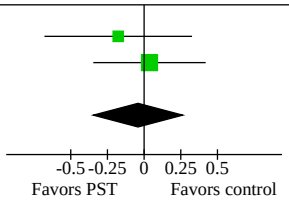
Heterogeneity: Tau² = 0.00; Chi² = 1.54, df = 4 (P = 0.82); I² = 0%
Test for overall effect: Z = 2.91 (P = 0.004)
Test for subgroup differences: Not applicable



Analysis 21.3. Comparison 21: Problem-solving therapy follow-up, Outcome 3: Child behavior/disability

Study or Subgroup	PST Mean	PST SD	PST Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
Palermo 2016a	7.84	5.5	31	8.75	4.64	30	36.7%	-0.18 [-0.68 , 0.33]
Wade 2014	46.4	49.68	50	44.73	40.77	55	63.3%	0.04 [-0.35 , 0.42]
Total (95% CI)			**81**			**85**	**100.0%**	**-0.04 [-0.35 , 0.26]**

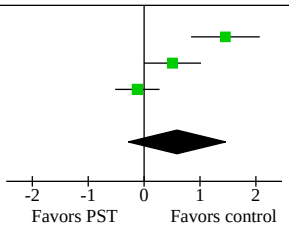
Heterogeneity: Tau² = 0.00; Chi² = 0.44, df = 1 (P = 0.51); I² = 0%
Test for overall effect: Z = 0.27 (P = 0.79)
Test for subgroup differences: Not applicable



Analysis 21.4. Comparison 21: Problem-solving therapy follow-up, Outcome 4: Child mental health

Study or Subgroup	PST Mean	PST SD	PST Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
Husted 2014	-56	4.8	23	-62	3.4	30	31.7%	1.45 [0.84 , 2.07]
Palermo 2016a	11.53	5.37	31	8.71	5.6	30	33.3%	0.51 [-0.00 , 1.02]
Wade 2014	50.83	12.5	48	52.34	12.32	50	34.9%	-0.12 [-0.52 , 0.28]
Total (95% CI)			**102**			**110**	**100.0%**	**0.59 [-0.28 , 1.46]**

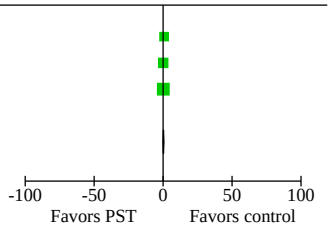
Heterogeneity: Tau² = 0.52; Chi² = 18.10, df = 2 (P = 0.0001); I² = 89%
Test for overall effect: Z = 1.32 (P = 0.19)
Test for subgroup differences: Not applicable



Analysis 21.5. Comparison 21: Problem-solving therapy follow-up, Outcome 5: Child symptoms

Study or Subgroup	PST Mean	PST SD	PST Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
Husted 2014	9.6	0.3	23	9.4	0.3	30	26.7%	0.66 [0.10 , 1.22]
Palermo 2016a	5.42	2.05	31	5.3	2.12	30	31.2%	0.06 [-0.45 , 0.56]
Seid 2010	-76.2	21.6	46	-79.2	18.8	50	42.1%	0.15 [-0.25 , 0.55]
Total (95% CI)			**100**			**110**	**100.0%**	**0.25 [-0.08 , 0.59]**

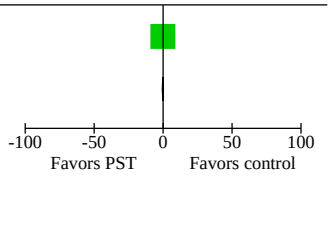
Heterogeneity: Tau² = 0.03; Chi² = 2.86, df = 2 (P = 0.24); I² = 30%
Test for overall effect: Z = 1.51 (P = 0.13)
Test for subgroup differences: Not applicable



Analysis 21.6. Comparison 21: Problem-solving therapy follow-up, Outcome 6: Family functioning

Study or Subgroup	PST Mean	PST SD	PST Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
Wade 2014	1.95	0.37	49	2.02	0.46	52	100.0%	-0.17 [-0.56 , 0.23]
Total (95% CI)			**49**			**52**	**100.0%**	**-0.17 [-0.56 , 0.23]**

Heterogeneity: Not applicable
Test for overall effect: Z = 0.83 (P = 0.41)
Test for subgroup differences: Not applicable



ADDITIONAL TABLES

Table 1. Therapy characteristics of included studies

Study	Medical condition	Therapy-type	Duration of therapy (child/parent)	Proportion of therapy (child:parent)	Mode of delivery (face-to-face vs remote)	Format of delivery (individual vs family vs group)	Therapy delivered by	Therapisttraining
Ambrosino 2008	Diabetes	CBT	6 x 1.5-h sessions/6 x 1.5-h sessions	50:50	Face-to-face	Group	Mental health professional	Not reported
Bonnert 2017	Chronic pain	CBT	10 modules/5 modules	67:33	Remote-internet	Individual	Internet + clinical psychologists	CBT training
Daniel 2015	Chronic pain	PST	7-h workshop + 3 x 30-min phone calls/7-h workshop + 3 x 30-min phone calls	50:50	Face-to-face + remote-telephone	Individual, family, group	Doctoral + master's graduate students and peer patient navigator	Training in SCD, problem-solving therapy and cultural considerations. Supervised by a licensed psychologist
Doherty 2013	Diabetes	CBT	0/10 x 1-h modules Sum: 0/10 h	0:100	Remote-self-guided workbook	Individual	Self-guided workbook	n/a
Ellis 2005	Diabetes	MST	46 sessions/46 sessions	50:50	Face-to-face + remote-telephone	Family	Therapist	Not reported
Ellis 2012	Diabetes	MST	48 sessions/48 sessions	50:50	Face-to-face	Family	Master's-level therapist	5-day training, phone consultation with MST expert, follow-up booster
Ellis 2017a	Diabetes	MI	Arm 1: 3 MI sessions/3 MI sessions Arm 2: 3 MI sessions/3 EDU sessions	50:50	Remote-internet	Individual	Internet	Not reported
Ellis 2017b	Diabetes	MST	Twice weekly 30-90-min sessions for 20 weeks/twice weekly 30-90-min sessions for 20 weeks	50:50	Face-to-face	Family	Community health workers	Community health worker competency training by Michigan Community Health Worker Alliance +

Table 1. Therapy characteristics of included studies *(Continued)*

								80 h of training in the treatment protocol
Greenley 2015	IBD	PST	Arm 1: 2 x 45-75-min sessions/2 x 45-75-min sessions Arm 2: 4, 45-75 min sessions/4, 45-75 min sessions	50:50	Face-to-face	Family	Psychology graduate students	10 h of PSST training
Hoekstra-Weebers 1998	Cancer	CBT	0/8 x 90-min sessions	0:100	Face-to-face	Individual	Psychologist	Not reported
Husted 2014	Diabetes	PST	8 x 1-h sessions/8 x 1-h sessions	50:50	Face-to-face	Individual, family	Pediatric physicians, pediatric diabetes nurses, dieticians	Not reported
Kashikar-Zuck 2012	Chronic pain	CBT	8 x 45-min sessions/3 x 45-min sessions	73:27	Face-to-face	Individual	Psychology postdoctoral fellow	6-8 h CBT training by PI, ongoing supervision
Kazak 2004	Cancer	FT	7-h workshop/7-h workshop	50:50	Face-to-face	Group	Nurses, social workers, clinical psychologists, graduate and psychology postdoctoral fellow	12-h training, included didactics, readings, role-play, observation
Laffel 2003	Diabetes	CBT	4 sessions/4 sessions	50:50	Face-to-face	Family	Research assistant	Not reported
Law 2015	Chronic pain	CBT	8 x 30-min modules/8 x 30-min modules	50:50	Remote-internet	Individual	Internet + psychology postdoctoral fellow	Not reported
Levy 2010	Chronic pain	CBT	3 x 75-min sessions/3 x 75-min sessions	50:50	Face-to-face	Individual	Master's-level therapist	Not reported
Levy 2016	IBD	CBT	3 x 75-min sessions/3 x 75-min sessions	50:50	Face-to-face	Individual, family	Master's-level therapist	Not reported
Levy 2017	Chronic pain	CBT	0/3 x 60-min sessions	0:100	Arm 1: face-to-face	Individual	Advanced clinical psychology graduate students, master's-level social workers	Treatment manual, training in administering interventions, including didactic instruction, viewing demonstration recordings, role

Table 1. Therapy characteristics of included studies *(Continued)*

					Arm 2: remote-telephone			play practice, and feedback from trainers
May 2017	Diabetes	MI	0/30 mins	0:100	Face-to-face	Individual	Clinical psychology doctoral student	Quarterly supervision from a pediatric psychologist
Mayer-Davis 2015	Diabetes	MI	3-5 x 40-60-min sessions/3-5 x 40-60-min sessions	50:50	Face-to-face	Individual, family	Pediatric diabetes clinicians/educators	2-d motivational interview training, 2-d recruitment and intervention workshop. Continuous training and supervision calls were held weekly
Morawska 2016	Asthma and eczema	CBT	0/2 x 2-h sessions	0:100	Face-to-face	Group	Psychologists, nurses	Not reported
Naar-King 2014	Asthma	MST	31 sessions/31 sessions	50:50	Face-to-face	Family	Master's-level therapist	5-d MST training, weekly supervision, quarterly booster sessions
Nansel 2009	Diabetes	PST	3 sessions, 9 phone calls/3 sessions, 9 phone calls	50:50	Face-to-face + remote-telephone	Family	Health advisors (college graduates)	Not reported
Nansel 2012	Diabetes	PST	6 sessions, 18 phone calls/6 sessions, 18 phone calls	50:50	Face-to-face+ remote-telephone	Family	Health advisors	Not reported
Palermo 2009	Chronic pain	CBT	8 x 30-min modules/8 x 30-min modules	50:50	Remote-internet	Individual	Internet + Psychology postdoctoral fellow	1 year of experience delivering Face-to-face CBT to children with chronic pain
Palermo 2016a	Chronic pain	PST	0/4-6 x 1-h sessions	0:100	Face-to-face + remote-telephone	Individual	Psychology postdoctoral fellows, clinical psychologist	Didactic training, including review of treatment materials and role play of treatment sessions with a trained therapist, weekly cross-site supervision with a licensed clinical psychologist

Table 1. Therapy characteristics of included studies *(Continued)*

Palermo 2016b	Chronic pain	CBT	8 x 30-min modules/8 x 30-min modules	50:50	Remote-internet	Individual	Internet + master's degree- or PhD-level psychology postdoctoral fellow	Online coach manual + standard series training tasks including readings, role play, and supervision by first author
Powers 2013	Chronic pain	CBT	8 x 1-h sessions + 5 booster sessions/3 x 1-h sessions + 5 booster sessions	73:27	Face-to-face	Individual	Postdoctoral psychology fellows	Trained and supervised by a licensed clinical psychologist with specialized experience in pain management
Robins 2005	Chronic pain	CBT	5 x 40-min sessions/3 x 40-min sessions	63:37	Face-to-face	Individual	Pre-doctoral psychology intern, postdoctoral psychology fellow	Not reported
Sahler 2002	Cancer	PST	0/8 x 1-h sessions	0:100	Face-to-face+ remote-telephone	Individual	Master's-level therapist, psychology doctoral candidate	3-d workshop, regular supervision
Sahler 2005	Cancer	PST	0/8 x 1-h sessions	0:100	Face-to-face	Individual	Not reported	Not reported
Sahler 2013	Cancer	PST	0/8 x 1-h sessions	0:100	Face-to-face	Individual	Psychology graduate students	Group training, weekly individual supervision
Sanders 1994	Chronic pain	CBT	6 x 50-min sessions/6 x 50-min sessions	50:50	Face-to-face	Individual	Clinical psychologists	Not reported
Seid 2010	Asthma	PST	11 x 60-min sessions/11 x 60-min sessions	50:50	Face-to-face	Family	Master's-level health educator	2-week training including didactics, role play, observation. Weekly supervision
Stark 2005	Chronic pain	BI	4 x 90-min sessions/4 x 90-min sessions	50:50	Face-to-face	Group	Parents: PhD psychologist. Children: postdoctoral fellow, research assistant	Review of treatment materials, role play, weekly supervision
Stehl 2009	Cancer	CBT	0/3 x 45-min sessions + 3 boosters	0:100	Face-to-face + Remote-CD-	Individual	Psychology fellows, psychology intern, master's-level psy-	18 h of didactic and experiential training, weekly supervision

Table 1. Therapy characteristics of included studies *(Continued)*

					ROM + telephone		chologist, doctoral-level nurse	
Tsitsi 2017	Cancer	CBT	0/3 x 25-min sessions + 3 weeks of daily practice	0:100	Remote-CD	Individual	Digital media player + research assistant	Not reported
Wade 2006a	TBI	PST	8-14 modules + video conferences/8-14 modules + video conferences	50:50	Remote-internet + teleconference	Family	Internet + clinical psychology graduate student	2-month training, weekly supervision, treatment manual
Wade 2014	TBI	PST	8-12 modules + 6 video conferences/8-12 modules + 6 video conferences	50:50	Remote-internet + videoconference	Family	Internet + clinical psychologists	Not reported
Wade 2017	TBI	CBT	I-InTERACT Program = 10-14 modules, weekly video conference I-InTERACT Express = 7 modules, weekly video conference	50:50	Remote-internet + videoconference	Individual	Licensed psychologists, postdoctoral fellow, advanced clinical psychology graduate students	Treatment manual + 3-d training, weekly supervision and fidelity checklists
Westrupp 2015	Diabetes	CBT	0/10 x 1-h sessions	0:100	Face-to-face	Individual	Clinical psychologist	Not reported
Wysocki 1999	Diabetes	FT	10 sessions/10 sessions	50:50	Face-to-face	Family	Clinical psychologist	Not reported
Wysocki 2006	Diabetes	FT	12 sessions/12 sessions	50:50	Face-to-face	Family	Clinical psychologist, social worker	Not reported
Yeh 2016	Asthma	FT	4 x 50-min sessions/4 x 50-min sessions	50:50	Face-to-face	Family	Not reported	Not reported

BI: Behavioral intervention; **CBT:** cognitive-behavioural therapy; **FT:** family therapy; **MI:** Motivational Interviewing; **MST:** multisystemic therapy; **PI:** principal investigator; **PSST:** problem-solving skills training; **PST:** problem-solving therapy; **TBI:** traumatic brain injury

Table 2. Intervention content and therapy classification of included studies

Author	Therapy summary	Therapy type
Ambrosino 2008 Diabetes	**Coping skills training**. Parents and children received training in communication skills, social problem solving, recognizing links between thoughts/feelings/behaviors, stress management and conflict resolution. The focus of this intervention was to improve participants' general ability to manage daily problems, and did not directly address diabetes management	CBT
Bonnert 2017 Chronic pain	**Exposure-based internet-CBT.** Using an internet program, families received training in using exposure exercises to reduce symptom-fear and avoidance (e.g. eating symptom-provoking foods and avoiding symptom-reducing behavior, rest). Parent modules focused on operant training, communication skills, problem solving, and relapse prevention. Children received psychoeducation and training in exposure exercises	CBT
Daniel 2015 Chronic pain	**Families Taking Control.** Using a full-day (7-h) weekend workshop at the hospital for children, their primary parents, and school-age siblings. The intervention was based on a problem-solving framework. Families received psychoeducation, an introduction of the problem-solving model, and goal identification. Parents and children received training in applying problem-solving to school challenges. Following the workshop, families had 3 booster phone call sessions to support skills implementation	PST
Doherty 2013 Diabetes	**Triple P Positive Parenting Program.** Using a self-directed workbook, parents received training in goal setting, using behavioral contracts to increase desirable behavior and manage problem behavior, monitoring effectiveness of behavior plans and amending where necessary, strategies for dealing with risky behavior, and maintenance planning. A tip sheet was also provided, which illustrated application of workbook skills to address common challenges among families of children with diabetes	CBT
Ellis 2005 Diabetes	**MST.** Families received an intensive, family- and community-based intervention designed to target problems related to adherence to diabetes treatment across the multiple systems within which the child and their family operated. A variety of psychological interventions were employed depending on individual need, including CBT, parent training and behavioral family systems therapy	MST
Ellis 2012 Diabetes	**MST.** Families received an intensive, family-centered, community-based intervention designed for adolescents with poor-self management of diabetes. Parent intervention included education about diabetes care, operant training, and communication skills training. Peer intervention included enlisting the support of peers to support regimen adherence. School interventions included problem solving with school personnel to monitor, support and communicate with the family regarding the adolescent's diabetes care and regimen adherence. Strategies were also developed to support the adolescent's regimen adherence in community settings, and to promote a positive working relationship with healthcare providers. Adolescent interventions focused on improving diabetes care skills and increasing motivation for completing diabetes care	MST
Ellis 2017a Diabetes	**The 3Ms Intervention.** Parents and children received motivational interviewing using CIAS, a flexible internet-based interactive software that delivers motivational content via a life-like animated narrator that speaks, moves, points, and displays emotional responses as appropriate. The parent intervention included 4 strategies: 1) Engagement via the narrator's communication of empathy and optimism, 2) Focusing the parent on the potential value of parental monitoring of diabetes via psychoeducation, 3) Evoking change talk and commitment language by eliciting the parent's views regarding monitoring diabetes care, and 4) Planning through optional goal setting activities. The ado-	MI

Table 2. Intervention content and therapy classification of included studies *(Continued)*

	lescent intervention mirrored the parent intervention with content that was focused on motivating the adolescent to complete their own diabetes management	
Ellis 2017b Diabetes	**REACH for Control.** Parents and children received motivational interviewing using CIAS, a flexible internet-based interactive software that delivers motivational content via a life-like animated narrator that speaks, moves, points, and displays emotional responses as appropriate. The parent intervention included four strategies: 1) engagement via the narrator's communication of empathy and optimism; 2) focusing the parent on the potential value of parental monitoring of diabetes via psychoeducation; 3) evoking change talk and commitment language by eliciting the parent's views regarding monitoring diabetes care; and 4) planning through optional goal-setting activities. The adolescent intervention mirrored the parent intervention with content that was focused on motivating the adolescent to complete their own diabetes management	MST
Greenley 2015 IBD	**Problem-solving skills training.** Families received telephone-delivered PSST to address adherence barriers. PSST skills included developing a positive problem outlook, formulating a clear and specific problem definition, brainstorming possible solutions, choosing the best solution, and formulating a solution implementation plan	PST
Hoekstra-Weebers 1998 Cancer	**Intervention program for parents of pediatric cancer patients.** Parents received education regarding the potential impact of the child's illness on the child and family as well as training in emotional expression, cognitive restructuring, problem-focused coping skills, communication and assertiveness skills. Children did not receive any intervention	CBT
Husted 2014 Diabetes	**Guided self-determination-youth.** Children and parents received training in shared decision-making and mutual, dynamic problem solving	
Kashikar-Zuck 2012 Chronic pain	**CBT for the treatment of juvenile fibromyalgia.** This intervention is a revised version of the Coping Skills Training program evaluated in Kashikar-Zuck 2005. Parents received operant training with a focus on encouraging independent pain management, maintaining a normal routine, avoiding status checks and increasing their child's use of coping skills learned in the program. Children received education about behavioral pain management as well as training in progressive muscle relaxation, distraction, activity pacing, using self statements, problem solving and relapse prevention strategies	CBT
Kazak 2004 Cancer	**Surviving Cancer Competently Intervention Programme (SCCIP).** Families received education about the link between thoughts, feelings and behaviors and training in cognitive restructuring. Families also participated in discussion groups about the ways cancer has affected their family, recognizing and responding to distress in other family members, and acknowledging and accepting their cancer experience	CBT
Laffel 2003 Diabetes	**Teamwork intervention.** Parents and children received training in communicating about diabetes and sharing blood glucose results with family members, the need for teamwork between parents and children in diabetes management during adolescence, managing family members' responses to the child's blood glucose levels, sharing diabetes management with family members, and using a diary to help problem solve high and low blood glucose levels	FT
Law 2015	**Web-based Management of Adolescent Pain (Web-MAP).** See Palermo 2009 below	CBT

Table 2. Intervention content and therapy classification of included studies *(Continued)*

Chronic pain		
Levy 2010 Chronic pain	**Social learning and cognitive-behavioural therapy.** Children and parents received pain education in addition training in deep breathing, progressive muscle relaxation, imagery, operant strategies, cognitive restructuring and relapse prevention strategies	CBT
Levy 2016 IBD	**Social learning and CBT.** Children and parents received instruction in cognitive-behavioural coping strategies of relaxation, stress management, and cognitive restructuring. Parents received training in operant strategies	CBT
Levy 2017 Chronic pain	**Social learning and CBT.** Parents received training in cognitive restructuring, operant training, and skills maintenance strategies. Children did not receive any intervention. Treatment was delivered in person or via telephone	CBT
May 2017 Diabetes	**Feedback intervention.** Parents received in vivo observation of communication skills while discussing a problem in diabetes care with their child. Using motivational interviewing, the interventionist provided individualized feedback to parents on their use of person-centered communication skills	MI
Mayer-Davis 2015 Diabetes	**Flexible Lifestyles for Youth intervention (FL3X).** Families received an intervention that is framed through MI and includes training in problem-solving and elements of behavioral family systems therapy	MI
Morawska 2016 Asthma and eczema	**Positive Parenting for Healthy Living.** Parents received training in strategies to prevent and manage problem behaviors and ensure that medical recommendations were implemented appropriately. Topics included continuing regular activities, having realistic expectations, reducing stress, helping siblings cope, condition-specific management steps, involving the child, communicating with parents, keeping track of symptoms, being prepared for emergencies, causes of behavior problems in children with chronic illness, and operant training. Children did not receive any intervention	CBT
Naar-King 2014 Asthma	**Multisystemic therapy adapted for health care settings (MST-HC).** Adolescents received training in asthma education. Parents received operant training, communication skills training, and problem solving to develop family routines around the adolescent's asthma care. School interventions included strategies to support communication between the family and the school and increasing accessibility of medications to youths while in school. Strategies were also developed to support a positive relationship between the family and healthcare providers	MST
Nansel 2009 Diabetes	**WE*CAN Intervention.** Parents and children jointly selected a goal for the child's diabetes management and developed a plan to address this problem using the WE*CAN process: W – work together to set goals, E – explore possible barriers and solutions, C – choose the best solutions, A – act on your plan, N – note the results	PST
Nansel 2012 Diabetes	See Nansel 2009	PST
Palermo 2009 Chronic pain	**Web-based Management of Adolescent Pain (Web-MAP).** Using an internet program, parents received education about chronic pain and training in recognizing stress and negative emotions, operant strategies, modeling, sleep hygiene and lifestyle, communication and relapse prevention. Children received education about chronic pain and training in recognizing stress and negative emotions, deep breathing and relaxation, distraction, cognitive skills, sleep hygiene and lifestyle, staying active and relapse prevention	CBT

Table 2. Intervention content and therapy classification of included studies *(Continued)*

Palermo 2016a Chronic pain condition (Mixed pain conditions)	**Problem-solving skills training.** This intervention is a modified version of the problem-solving skills training intervention evaluated in Sahler 2002. Parents received problem solving using the Bright IDEAS framework including using a positive problem-solving orientation, problem definition and formulation (Identify the problem), generation of alternative solutions (Determine the options), decision-making (Evaluate options), solution implementation (Act), and verification (See if it worked). Children did not receive any intervention	PST
Palermo 2016b Chronic pain	**Web-based Management of Adolescent Pain-2 (Web-MAP2).** This intervention is a modified version of the Web-based Management of Adolescent Pain (Web-MAP) intervention evaluated in Palermo 2009. Using an internet program, children and parents received education about chronic pain, training in behavioral and cognitive coping skills, instruction in increasing activity participation and healthy lifestyle habits, and education about pain behaviors and parental operant and communication strategies	CBT
Powers 2013 Chronic pain	**CBT intervention.** This treatment was based on the CBT intervention evaluated in Kashikar-Zuck 2012, modified to include biofeedback for relaxation training. Children and parents received the intervention	CBT
Robins 2005 Chronic pain	**Short-term CBT.** Children and parents received education about pain and stress as well as training in deep breathing, imagery, relaxation and operant strategies. Children also received training in tracking the antecedents and consequences of pain episodes and cognitive restructuring	CBT
Sahler 2002 Cancer	**PSST.** Mothers received problem-solving training using the Bright IDEAS framework: Be optimistic about solving problems, Identify the problem, Determine options, Evaluate options and choose one, Act and See if it worked. Children did not receive any intervention	PST
Sahler 2005 Cancer	**PSST.** See Sahler 2002	PST
Sahler 2013 Cancer	**PSST.** See Sahler 2002	PST
Sanders 1994 Chronic pain	**Cognitive-behavioral family intervention.** Parents received education about behavioral pain management, operant training and relapse prevention. Children received education about behavioral pain management, muscle relaxation, deep breathing, imagery, cognitive restructuring, distraction and relapse prevention	CBT
Seid 2010 Asthma	**Problem-solving skills training + care co-ordination.** Parents received in-home asthma education, referrals to community resources, co-ordination with medical providers and problem-solving training using the Bright IDEAS framework (see Sahler 2002 above)**.** The intervention targeted caregivers although children were encouraged to participate.	PST
Stark 2005 Chronic pain	**BI.** Parents received nutrition education and operant training focused on gradually increasing their child's calcium intake. Children received nutrition education and participated in a practice meal during each session where operant techniques were used to motivate children to reach their calcium goals during the meal	BI
Stehl 2009 Cancer	**Surviving Cancer Competently Intervention Programme – newly diagnosed (SCCIP-ND).** Parents received education about the link between thoughts, feelings and behaviors, training in cognitive restructuring, and dis-	CBT

Table 2. Intervention content and therapy classification of included studies *(Continued)*

	cussion of beliefs about the role cancer will play in the family's future. Parents also watched a CD-ROM of other parents of children with cancer discussing their experiences and responses to diagnosis. Children did not receive any intervention	
Tsitsi 2017 Cancer	**Combination of progressive muscle relaxation and guided imagery.** Parents received training in progressive muscle relaxation and guided imagery. Children did not receive any intervention	CBT
Wade 2006a TBI	**Family problem-solving intervention.** Using an internet program and teleconferencing, families received training in problem solving, communication, behavior management skills and relapse prevention. Families could also complete supplemental sessions if needed on stress management, working with the school, sibling concerns, anger management, pain management and marital communication	PST
Wade 2014 TBI	**Counselor-Assisted Problem Solving (CAPS).** Using a combination of face-to-face, internet program, and videoconferencing, families received training in problem solving using the ABCDE framework (Aim, Brainstorm, Choose, Do it and Evaluate). Families also received communication skills training. Children were taught a self-regulation heuristic (Stop, Monitor, Appraise, Reflect, Try). Optional modules were also available targeting communication skills, parent self-care, social skills, after high school, sibling issues, pain management, sleep, and memory	PST
Wade 2017 TBI	**I-InTERACT Program.** I-Interact provided parenting skills training and strategies for behavior management through online modules and videoconferencing meetings with a trained therapist. Skills training included consequence-focused and antecedent behavior management, and psychoeducation about the effects of TBI on child development. **I-InTERACT Express.** The express program provided an abbreviated parent training intervention delivered through online modules and videoconferencing with a trained therapist that focused on developing a warm, responsive parent-child relationship and providing consistent discipline	CBT
Westrupp 2015 Diabetes	**Triple P Positive Parenting.** Parents received training in skills designed to promote children's competence and development, and in skills to help manage misbehavior. Children did not receive any intervention	CBT
Wysocki 1999 Diabetes	**Behavioral Family Systems Therapy (BFST).** Families received training in problem-solving skills, communication skills and cognitive restructuring as well as functional and structural family therapy interventions targeting family systems issues that may have interfered with effective problem-solving and communication skills	FT
Wysocki 2006 Diabetes	**Behavioral Family Systems Therapy for Diabetes (BFST-D).** This intervention is a revised version of the BFST intervention evaluated in Wysocki 1999. Families received training in problem solving, communication skills and cognitive restructuring as well as functional and structural family therapy interventions targeting family systems issues related to effective problem solving and communication. Diabetes-specific adaptations included targeting two or more barriers to diabetes management in treatment, training in behavioral contracting, education in how to improve diabetic control based on data from self-monitoring of blood glucose levels, simulation of living with diabetes by parents for 1 week, and involvement of peers/teachers/extended family in treatment as needed	FT
Yeh 2016 Asthma	**Asthma Family Empowerment Program (AFEP).** Based on a family systems approach, AFEP aimed to help families maintain equilibrium by identifying problems and trying solutions by themselves. Families were provided with ed-	FT

Table 2. Intervention content and therapy classification of included studies *(Continued)*

	ucation about asthma and condition management, support for positive coping behaviors, and resources to help manage the condition. Study therapists encouraged families to address problems themselves, including making decisions for actionable changes and choosing solutions through family discussions

BFST-D: Behavioral Family Systems Therapy for Diabetes; **BI:** behavioral intervention; **CBT:** cognitive-behavioural therapy; **FT:** family therapy; I**BS:** irritable bowel syndrome; **MST:** multisystemic therapy; **PST:** problem-solving therapy; **TBI:** traumatic brain injury

APPENDICES

Appendix 1. Search strategies

CENTRAL (CRSO)

#1 MESH DESCRIPTOR Psychotherapy EXPLODE ALL TREES

#2 MESH DESCRIPTOR Problem Solving EXPLODE ALL TREES

#3 psychotherap*:TI,AB,KY

#4 ((cogniti* or family or behavior* or behaviour* or psychological*) adj5 (intervention* or treatment* or therap*)):TI,AB,KY

#5 ((problem* adj5 solv*)):TI,AB,KY

#6 CBT:TI,AB,KY

#7 #1 OR #2 OR #3 OR #4 OR #5 OR #6

#8 MESH DESCRIPTOR Parents EXPLODE ALL TREES

#9 MESH DESCRIPTOR Family EXPLODE ALL TREES

#10 MESH DESCRIPTOR Caregivers

#11 ((parent* or mother* or father* or family or families or caregiver* or care-giver*)):TI,AB,KY

#12 #8 OR #9 OR #10 OR #11

#13 MESH DESCRIPTOR Child EXPLODE ALL TREES

#14 MESH DESCRIPTOR Infant EXPLODE ALL TREES

#15 MESH DESCRIPTOR Adolescent EXPLODE ALL TREES

#16 ((child* or infant* or adolesc* or baby or babies or toddler* or teenager* or youth*)):TI,AB,KY

#17 #13 OR #14 OR #15 OR #16

#18 MESH DESCRIPTOR Pain EXPLODE ALL TREES

#19 MESH DESCRIPTOR Complex Regional Pain Syndromes EXPLODE ALL TREES

#20 MESH DESCRIPTOR Rheumatic Diseases EXPLODE ALL TREES

#21 MESH DESCRIPTOR Neoplasms EXPLODE ALL TREES

#22 MESH DESCRIPTOR Diabetes Mellitus EXPLODE ALL TREES

#23 MESH DESCRIPTOR Asthma EXPLODE ALL TREES

#24 MESH DESCRIPTOR Brain Injuries EXPLODE ALL TREES

#25 MESH DESCRIPTOR Inflammatory Bowel Diseases EXPLODE ALL TREES

#26 MESH DESCRIPTOR Anemia, Sickle Cell EXPLODE ALL TREES

#27 MESH DESCRIPTOR Skin Diseases EXPLODE ALL TREES

#28 MESH DESCRIPTOR Genital Diseases, Female EXPLODE ALL TREES

#29 MESH DESCRIPTOR Menstruation Disturbances EXPLODE ALL TREES

#30 ((pain* or headache*)):TI,AB,KY

#31 ((rheumat* or arthriti* or fibromyalgia)):TI,AB,KY

#32 ((cancer* or neoplas* or tumor* or tumour* or malignan* or carcinoma*)):TI,AB,KY

#33 diabet*:TI,AB,KY

#34 asthma*:TI,AB,KY

#35 ((brain adj5 (trauma* or injur*))):TI,AB,KY

#36 ((bowel* adj5 inflammatory adj5 (condition* or disease* or illness*))):TI,AB,KY

#37 ((sickle cell adj5 (disease* or disorder* or anemia*))):TI,AB,KY

#38 (((skin adj5 (disease* or disorder*)) or eczema*)):TI,AB,KY

#39 (((gynecologic* or gynaecologic*) adj5 (disease* or disorder*))):TI,AB,KY

#40 dysmenorrh*:TI,AB,KY

#41 endometriosis:TI,AB,KY

#42 MESH DESCRIPTOR Chronic Disease

#43 (((chronic* or longterm or long-term) adj5 (condition* or ill* or disease*))):TI,AB,KY

#44 #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27 OR #28 OR #29 OR #30 OR #31 OR #32 OR #33 OR #34 OR #35 OR #36 OR #37 OR #38 OR #39 OR #40 OR #41 OR #42 OR #43

#45 #7 AND #12 AND #17 AND #44

#46 01/07/2014 TO 25/04/2017:CD

#47 #45 AND #46

MEDLINE (OVID)

1 exp Psychotherapy/

2 Problem Solving/

3 psychotherap*.mp.

4 ((cogniti* or family or behavior* or behaviour* or psychological*) adj5 (intervention* or treatment* or therap*)).mp.

5 (problem* adj5 solv*).mp.

6 CBT.mp.

7 or/1-6

8 exp Parents/

9 exp Family/

10 Caregivers/

11 (parent* or mother* or father* or family or families or caregiver* or care-giver*).mp.

12 or/8-11

13 exp Child/

14 exp Infant/

15 Adolescent/

16 (child* or infant* or adolesc* or baby or babies or toddler* or teenager* or youth*).mp.

17 or/13-16

18 exp Pain/

19 exp Complex Regional Pain Syndromes/

20 exp Rheumatic Diseases/

21 exp Neoplasms/

22 exp Diabetes Mellitus/

23 exp Asthma/

24 exp Brain Injuries/

25 exp Inflammatory Bowel Diseases/

26 exp Anemia, Sickle Cell/

27 exp Skin Diseases/

28 exp Genital Diseases, Female/

29 exp menstruation disturbances/

30 (pain* or headache*).mp.

31 (rheumat* or arthriti* or fibromyalgia).mp.

32 (cancer* or neoplas* or tumor* or tumour* or malignan* or carcinoma*).mp.

33 diabet*.mp.

34 asthma*.mp.

35 (brain adj5 (trauma* or injur*)).mp.

36 (bowel* adj5 inflammatory adj5 (condition* or disease* or illness*)).mp.

37 (sickle cell adj5 (disease* or disorder* or anemia*)).mp.

38 ((skin adj5 (disease* or disorder*)) or eczema*).mp.

39 ((gynecologic* or gynaecologic*) adj5 (disease* or disorder*)).mp.

40 dysmenorrh*.mp.

41 endometriosis.mp.

42 Chronic Disease/

43 ((chronic* or longterm or long-term) adj5 (condition* or ill* or disease*)).mp.

44 or/18-43

45 randomized controlled trial.pt.

46 controlled clinical trial.pt.

47 randomized.ab.

48 placebo.ab.

49 drug therapy.fs.

50 randomly.ab.

51 trial.ab.

52 groups.ab.

53 45 or 46 or 47 or 48 or 49 or 50 or 51 or 52

54 exp animals/ not humans.sh.

55 53 not 54

56 7 and 12 and 17 and 44 and 55

57 (201203* or 201204* or 201205* or 201206* or 201207* or 201208* or 201209* or 201210* or 201011* or 201212* or 2013* or 2014*).ed.

58 56 and 57

Embase (OVID)

1 exp Psychotherapy/

2 Problem Solving/

3 psychotherap*.mp.

4 ((cogniti* or family or behavior* or behaviour* or psychological*) adj5 (intervention* or treatment* or therap*)).mp.

5 (problem* adj5 solv*).mp.

6 CBT.mp.

7 or/1-6

8 exp Parents/

9 exp Family/

10 Caregivers/

11 (parent* or mother* or father* or family or families or caregiver* or care-giver*).mp.

12 or/8-11

13 exp Child/

14 exp Infant/

15 Adolescent/

16 (child* or infant* or adolesc* or baby or babies or toddler* or teenager* or youth*).mp.

17 or/13-16

18 exp Pain/

19 exp Complex Regional Pain Syndromes/

20 exp Rheumatic Diseases/

21 exp Neoplasms/

22 exp Diabetes Mellitus/

23 exp Asthma/

24 exp Brain Injuries/

25 exp Inflammatory Bowel Diseases/

26 exp Anemia, Sickle Cell/

27 exp Skin Diseases/

28 exp Genital Diseases, Female/

29 exp menstruation disturbances/

30 (pain* or headache*).mp.

31 (rheumat* or arthriti* or fibromyalgia).mp.

32 (cancer* or neoplas* or tumor* or tumour* or malignan* or carcinoma*).mp.

33 diabet*.mp.

34 asthma*.mp.

35 (brain adj5 (trauma* or injur*)).mp.

36 (bowel* adj5 inflammatory adj5 (condition* or disease* or illness*)).mp.

37 (sickle cell adj5 (disease* or disorder* or anemia*)).mp.

38 ((skin adj5 (disease* or disorder*)) or eczema*).mp.

39 ((gynecologic* or gynaecologic*) adj5 (disease* or disorder*)).mp.

40 dysmenorrh*.mp.

41 endometriosis.mp.

42 Chronic Disease/

43 ((chronic* or longterm or long-term) adj5 (condition* or ill* or disease*)).mp.

44 or/18-43

45 random$.tw.

46 factorial$.tw.

47 crossover$.tw.

48 cross over$.tw.

49 cross-over$.tw.

50 placebo$.tw.

51 (doubl$ adj blind$).tw.

52 (singl$ adj blind$).tw.

53 assign$.tw.

54 allocat$.tw.

55 volunteer$.tw.

56 Crossover Procedure/

57 double-blind procedure.tw.

58 Randomized Controlled Trial/

59 Single Blind Procedure/

60 or/45-59

61 (animal/ or nonhuman/) not human/

62 60 not 61

63 7 and 12 and 17 and 44 and 62

64 (201203* or 201204* or 201205* or 201206* or 201207* or 201208* or 201209* or 201210* or 201011* or 201212* or 2013* or 2014*).dd.

65 63 and 64

66 limit 65 to embase

PsycINFO (OVID)

1 exp Psychotherapy/

2 Problem Solving/

3 psychotherap*.mp.

4 ((cogniti* or family or behavior* or behaviour* or psychological*) adj5 (intervention* or treatment* or therap*)).mp.

5 (problem* adj5 solv*).mp.

6 CBT.mp.

7 or/1-6

8 exp Parents/

9 exp Family/

10 Caregivers/

11 (parent* or mother* or father* or family or families or caregiver* or care-giver*).mp.

12 or/8-11

13 (child* or infant* or adolesc* or baby or babies or toddler* or teenager* or youth*).mp.

14 exp Pain/

15 exp Rheumatoid Arthritis/

16 exp Neoplasms/

17 exp Diabetes Mellitus/

18 exp Asthma/

19 exp traumatic brain injury/

20 exp Sickle Cell Disease/

21 exp skin disorders/

22 exp gynecological disorders/

23 (pain* or headache*).mp.

24 (rheumat* or arthriti* or fibromyalgia).mp.

25 (cancer* or neoplas* or tumor* or tumour* or malignan* or carcinoma*).mp.

26 diabet*.mp.

27 asthma*.mp.

28 (brain adj5 (trauma* or injur*)).mp.

29 (bowel* adj5 inflammatory adj5 (condition* or disease* or illness*)).mp.

30 (sickle cell adj5 (disease* or disorder* or anemia*)).mp.

31 ((skin adj5 (disease* or disorder*)) or eczema*).mp.

32 ((gynecologic* or gynaecologic*) adj5 (disease* or disorder*)).mp.

33 dysmenorrh*.mp.

34 endometriosis.mp.

35 ((chronic* or longterm or long-term) adj5 (condition* or ill* or disease*)).mp.

36 or/14-35

37 7 and 12 and 13 and 36

38 clinical trials/

39 (randomis* or randomiz*).tw.

40 (random$ adj3 (allocat$ or assign$)).tw.

41 ((clinic$ or control$) adj trial$).tw.

42 ((singl$ or doubl$ or trebl$ or tripl$) adj3 (blind$ or mask$)).tw.

43 (crossover$ or "cross over$").tw.

44 random sampling/

45 Experiment Controls/

46 Placebo/

47 placebo$.tw.

48 exp program evaluation/

49 treatment effectiveness evaluation/

50 ((effectiveness or evaluat$) adj3 (stud$ or research$)).tw.

51 or/38-50

52 37 and 51

53 limit 52 to yr="2014 -Current"

Appendix 2. Search results (2012, 2014)

2012 search results: we conducted the initial search from inception to June 2012. We extracted a total of 114 papers to identify whether they met the full inclusion criteria; we found 107 papers in the initial search, and a further 7 studies later in an updated search before publication. Of these 114 papers, we found 99 from the search of databases, 6 papers from the citation search, 4 papers from reference searches and 5 papers from authors of included studies. We deemed 35 studies (45 papers) to meet the inclusion criteria for the review, whilst we excluded 61 studies (69 papers).

2014 search results: the updated search identified studies from March 2012 to July 2014. We identified 418 abstracts in the database search and we read these for inclusion; we excluded 376. We identified 16 papers in the updated search that met the inclusion criteria, 3 of

which we identified as follow-up papers of already included studies. Therefore, we included 13 new studies in this update, adding to the 35 previously included studies. We excluded one previously included study (Grey 2011), as it combined data with another study already included in this review and would inflate the results if included. Therefore, in total there were 60 included papers and 47 included studies.

WHAT'S NEW

Date	Event	Description
14 June 2021	Review declared as stable	Stabilised until 2023. See Published notes.

HISTORY

Protocol first published: Issue 2, 2012
Review first published: Issue 8, 2012

Date	Event	Description
30 September 2019	Amended	Clarification added to Declarations of interest.
9 April 2019	Amended	Comma deleted in ongoing study reference (Ellis 2017b) and author Carcone formatted correctly in Ellis 2017a.
8 September 2018	New citation required and conclusions have changed	Eligibility criteria were changed so that only studies with more than 20 participants per treatment arm post-treatment were included. We added 21 new studies and removed 23 studies with fewer than 20 participants. There is now a total of 44 studies with 4697 participants at post-treatment. Our conclusions have changed from the last update in 2015.
8 September 2018	New search has been performed	We conducted an updated search from July 2014 to July 2018.
1 July 2014	New citation required but conclusions have not changed	Conclusions of the review have not altered from the original version in 2012. Three 'Summary of findings' tables have been added for this review.
1 July 2014	New search has been performed	An updated search from March 2012 to July 2014 was conducted and 13 new studies were added to the review.

CONTRIBUTIONS OF AUTHORS

EL oversaw authoring of the manuscript, was responsible for the methodology, obtained studies, searched reference lists, selected studies for inclusion, extracted data, entered data into Review Manager 5 (RevMan 5; Review Manager 2014), interpreted the analyses, drafted the review, and will update the review in the future.

EF obtained studies, searched reference lists, selected studies for inclusion, extracted data and entered data into RevMan 5, interpreted the analyses, drafted the review, and will update the review in the future.

CE was responsible for the methodology, interpreted the analyses, drafted the final manuscript, and will update the review in the future.

TP arbitrated the selection of studies, interpreted the analyses, drafted the final manuscript, and will update the review in the future.

DECLARATIONS OF INTEREST

EL: none known; EL is a pediatric psychologist and provides clinical service to children and adolescents with chronic pain. EL is an author on three studies included in this review (Law 2015; Palermo 2016a; Palermo 2016b), and was not involved in data extraction or assessments

of these studies. During the completion of this work, EL received salary support from the National Institutes of Health/National Institute of Neurological Disorders and Stroke (Grant number K23NS089966, PI: Law).

EF: none known.

CE: none known; CE is an author on one study included in this review (Palermo 2016a), and was not involved in data extraction or assessments of this study. Since CE is an author as well as the PaPaS Co-ordinating Editor at the time of writing, we acknowledge the input of Phil Wiffen who acted as Sign Off Editor for this review. CE had no input into the editorial decisions or processes for this review.

TP: none known; TP is an author on four studies included in this review (Law 2015; Palermo 2009; Palermo 2016a; Palermo 2016b), and was not involved in data extraction or assessments of these studies. During the completion of this work, TP received salary support from the National Institutes of Health/National Institute of Child Health, Behavior and Development (K24HD060068, PI: Palermo).

SOURCES OF SUPPORT

Internal sources

- University of Bath, UK

External sources

- National Institutes of Health/National Institutes for Child Health and Human Development, USA

  Grant number: K24HD060068 (PI: Palermo)
- National Institutes of Health/National Institute of Neurological Disorders and Stroke, USA

  Grant number: K23NS089966 (PI: Law)

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

From the 2014 update, we included GRADE assessments for the quality of evidence. We removed concordance ratings and quality of evidence using the Yates scale, following Cochrane guidance (Schünemann 2011).

Differences between protocol and 2012 review publication:

- Language throughout the protocol has been altered to improve the flow and increase the accuracy.
- The tense of the language used in the methodology has been changed to past in line with Cochrane guidelines.
- Measures of treatment effect: this section has been added to provide a clearer description of intended analyses.
- The order of the four main analyses has been re-worded for a clearer understanding of the analysis plan. Parent outcomes have been listed before child outcomes as this is the focus of the review. Appendices were added for other search strategies.
- Assessment of risk of bias in included studies: this has been expanded to include a fuller description.

Differences between 2012 and 2014 updated publication:

- Quality of studies (Yates 2005), was deleted. Quality of evidence included using GRADE ratings.
- Consistency between aims, measures, and results removed for this updated review.

Differences between 2014 and 2018 updated publication:

- Updated the Background to include relevant citations published since the last update.
- Studies that included fewer than 20 participants/arm were excluded for this update.
- We renamed 'painful conditions', 'chronic pain conditions'.
- Inflammatory bowel diseases are combined with chronic pain conditions in this update.
- We included studies that combined psychological interventions with pharmacological interventions, given the relevance of pharmacological treatments for children with chronic medical conditions.
- We added Methods sections that were missing from prior versions of this review: 'Unit of analysis issues; Assessment of reporting biases; Sensitivity analysis.
- Assessment of heterogeneity: we now clarify that assessment of heterogeneity will be conducted for analyses with at least 10 studies per Cochrane guidance (Deeks 2017).
- Measures of treatment effect: we reworded this section to reduce redundancy with information provided in How the intervention might work (no methods were changed).
- Assessment of risk of bias in included studies: we revised this section to improve clarity and readability. We also made two changes to our methods: 1) for reporting bias, we rated studies as high risk if data were not fully reported in the manuscript even if study

authors provided these data on request; previously we rated this as unclear risk, 2) for attrition bias, we rated studies as unclear risk if insufficient data were provided to make a judgement (e.g. the study reported attrition but not differences between completers versus non-completers); previously we rated this as high risk.

- Data synthesis: we revised language to describe GRADE ratings to reflect current recommendations (no methods were changed).
- Subgroup analysis and investigation of heterogeneity: we revised our methods for subgroup analysis and investigation of heterogeneity and now focus on a single subgroup analysis: comparing intervention effects for studies with a wait-list control condition versus an active control condition. We chose to focus on this single subgroup analysis for the following reasons: 1) visual inspection indicated this may have contributed to heterogeneity, 2) the originally planned analyses were redundant with the primary aims of this review, and 3) this review includes a large number of primary analyses and as such we wanted to present a maximum of one subgroup analysis per Cochrane guidance (Deeks 2017).

NOTES

Assessed for updating in 2021

In June 2021 we did not identify any potentially relevant studies likely to change the conclusions. Therefore, this review has now been stabilised following discussion with the authors and editors. The review will be reassessed for updating in two years. If appropriate, we will update the review before this date if new evidence likely to change the conclusions is published, or if standards change substantially which necessitate major revisions. Should the review require updating, we will seek a new author team to complete it.

INDEX TERMS

Medical Subject Headings (MeSH)

Chronic Disease [*psychology]; Cognitive Behavioral Therapy; Family Relations; Family Therapy; Motivational Interviewing; Parenting [psychology]; Parents [*psychology]; Problem Solving; Psychotherapy [*methods]; Randomized Controlled Trials as Topic

MeSH check words

Adolescent; Child; Child, Preschool; Humans; Infant